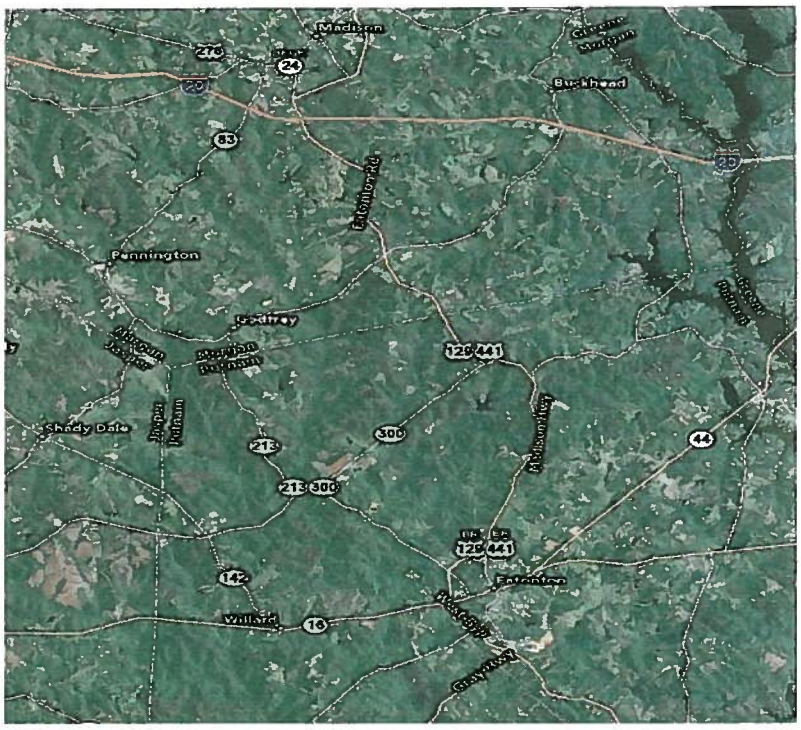
Value Engineering Study Report

US 441/SR 24 Widening/Reconstruction

EDS-441(44) PI No. 222570
EDS-441(45) PI No. 222580

Morgan and Putnam Counties



Value Management Team

Design Team:

September 2007

PBS&J

September 25, 2007

Ms. Lisa Myers
Design Review Engineer Manager
Georgia Department of Transportation
#2 Capitol Square, Room 266
Atlanta, GA 30334

RE: Submittal of the final Value Engineering Report
Project – EDS-441(44) (45)
Morgan and Putnam Counties
P.I. No. – 222570 & 222580
US 441/SR 24
PBS&J Project Task Order No. 17

Dear Ms. Myers:

Please find enclosed four (4) hard copies and a CD of our final Value Engineering Report for US 441/SR 24 in Morgan and Putnam Counties, as referenced above.

This Value Engineering Study, which was performed during the period September 10 through September 13, 2007, identified **15 Alternative Ideas** which **are recommended for implementation**. The VE Team also identified **18 Design Suggestion Ideas** which are recommended for the Engineer to consider in his final design. We believe that the **15 Alternative Ideas** recommended may have a significant positive affect on the project.

We trust that you will find this report to be in proper order. It should be noted that the results of this workshop are volatile in that they can be overcome by the events that accompany the expeditious continuance of the design process. Accordingly, we encourage an equally expeditious implementation meeting to design the disposition of the contents of this report.

On behalf of our VE Team, we thank you very much for this opportunity to work with you and the hard working staff of the Georgia Department of Transportation.

Yours truly,
PBS&J

Les M. Thomas

Les M. Thomas, P.E., CVS-Life
VE Team Leader

Value Engineering Study Report

Project –EDS-441 (44)(45)
Morgan/Putnam Counties
PI No: 222570 & 222580
US441/SR 24 Improvements

Table of Contents

EXECUTIVE SUMMARY

INTRODUCTION

This report summarizes the analysis and conclusions by the PBS&J Value Engineering workshop team as they performed a VE study during the period of September 10 – September 13, 2007 in Atlanta, at the office of the Georgia Department of Transportation. The subject of the Value Engineering study was Georgia Department of Transportantion Project EDS-441(44)(45), P.I. 222570 and 222580, US 441/SR 24.The concept design for the project has been prepared by Parsons, Brinckerhoff Quade & Douglas.. At the time of the workshop the plans had advanced to the concept design level.

PROJECT DESCRIPTION

This project consists of two project which are to address the US 441 widening from its southerly point at the Eatonton Bypass at Sherwood Avenue north to I-20. The projects generally consist of the widening and reconstruction of the existing two and three lane roadway to a four lane rural section with a 44' depressed median and to a four lane rural section with a 14' flush median connecting to the existing similar roadway at the existing I-20 interchange.

The projects address an existing 8.069 mile section in Morgan County and a 9.619 mile section in Putnam County.

The estimated construction cost for the Morgan County (EDS-441(44) (P.I. No. 222570 is $24,850,986 plus the Right of Way acquisition and reimbursable utilities costs. The estimated construction cost for the Putnam County. (EDS-441(45) (P.I. No. 222580) is $28,095,945 plus the Right of Way acquisition and reimbursable utilities costs.

This project is rather fully described in the documentation that is located in Tab 5 of this report, entitled ***Project Description.***

VALUE ENGINEERING PROCESS

The Value Engineering team followed the seven step Value Engineering job plan as promulgated by the Georgia Department of Transportation. This seven step job plan includes the following:

- Investigative
- Analysis
- Speculation
- Evaluation
- Development
- Recommendation
- Presentation

This report is a component of the Presentation Phase. As part of the VE workshop in Atlanta, the team made an informal presentation of their results on the last morning of the workshop. This report is intended to formalize the workshop results and set the stage for a formal implementation meeting in which alternatives and design suggestions will typically be accepted, accepted with modifications, or rejected for cause. The worksheet that follows, along with the formally developed alternatives and design suggestions can be used as a "score sheet" for the implementation meeting. It is also included in this report to identify, on a summary basis, the results of the workshop. The reader is encouraged to visit the third tabbed section of this report entitled ***Study Results*** for a review of the details of the developed alternatives. The tabbed section ***Project Description*** includes information about the project itself and the tabbed section ***Value Engineering Process*** presents the detail process of the Value Engineering Study.

CONCLUSIONS AND RECOMMENDATIONS

During the speculation phase the VE Team identified ***40 Alternative Ideas*** that appeared to hold potential for reducing the construction cost, improving the end product and/or reducing the difficulty and time of project construction.

After the evaluation phase was completed, **16** ***Alternative Ideas*** and **16 Design Suggestions** remained for further consideration. These Alternative Ideas and Design Suggestions may be found, in their documented form, in the section of this report entitled ***Study Results***. The following ***Summary of Alternatives and Design Suggestions*** coupled with the documentation of the developed alternatives should provide the reader with the information required to fully evaluate the merits of each of the alternatives.

These and the other alternatives and design suggestions may be reviewed more thoroughly where they are documented in the third tab of this report entitled ***Study Results***.

SUMMARY OF ALTERNATIVES & DESIGN SUGGESTIONS

Georgia Department of Transportation

US441/SR 24- Morgan/Putnam Counties -EDS-441(44)(45) - P.I. No. 222570 & 222580

Alternative Number	Description of Alternative	Initial Cost Savings
	EDS-441(45) Putnam County	
	ROADWAY (RD)	
RD-1	Reduce median width to 32' to reduce Right-of-Way	$512,862
RD-4	Re-align roadway to reduce required Right-of-Way	$93,688
RD-5	Utilize ROW for sedimentation basins	DS
RD-6	Utilize ROW to consolidate driveways	DS
RD-7	Use RAP from existing roadway	$1,185,638
RD-8	Retain existing pavement	$373,111
RD-10	Relocate Harmony Rd to minimize new construction	$255,200
RD-11	Adjust the Bethel Church Rd alignment to enhance the safety of traffic	DS
RD-12	Adjust the Price Road alignment to enhance the safety of traffic operations	DS
	EARTHWORK (EW)	
EW-1	Vertically bifurcate the roadway to reduce earthwork	$591,800
EW-2	Adjust fore slopes to reduce earthwork and Right-of-Way	$504,616
EW-3	Adjust vertical alignment to reduce borrow	$317,900
	DRAINAGE (DR)	
DR-1	Route median drains to downstream side of road	DS
DR-2	Reduce/consolidate sediment basins 435+00	DS
DR-3	Modify ROW to accommodate outfall maintenance	DS
DR-4	Re-evaluate the elimination of outfalls	DS
DR-5	Reduce cross drains	DS

SUMMARY OF ALTERNATIVES & DESIGN SUGGESTIONS

Georgia Department of Transportation

US441/SR 24- Morgan/Putnam Counties -EDS-441(44)(45) - P.I. No. 222570 & 222580

Alternative Number	Description of Alternative	Initial Cost Savings
	EDS-441(44) Morgan County	
	ROADWAY (RD)	
RD-31	Re-align roadway to reduce required Right-of-Way	$97,144
RD-32	Reduce Median width to 32' to reduce Right-of-Way	$441,259
RD-35	Utilize ROW for sedimentation basins	DS
RD-36	Utilize ROW to consolidate driveways	DS
RD-37	Use RAP from existing roadway	$1,051,022
RD-38	Retain existing pavement	$797,714
RD-40	Extend five lanes with shoulders to sta. 476	DS
RD-42	Re-design Seven Island Rd. intersection	DS
	EARTHWORK (EW)	
EW-31	Vertically bifurcate the roadway to reduce earthwork	$433,950
EW-32	Adjust fore slopes to reduce earthwork and Right-of-Way	370,041
EW-33	Reduce vertical alignment to reduce earthwork	173,800
	DRAINAGE (DR)	
DR-31	Route median drains to downstream side of roadway	DS
DR-32	Reduce/consolidate sediment basins	DS
DR-33	Modify Right-of-Way to accommodate outfall maintenance	DS
DR-34	Re-evaluate the elimination of outfalls	DS
DR-35	Re-evaluate the alignment of cross drains	DS

Study Results

Study Results

Introduction

This section includes the study results presented in the form of fully developed Value Engineering alternatives that include descriptions of the original design, description of the alternative design configurations, comments on the technical justifications, opportunities and risks associated with the alternatives, sketches, calculations and technical justification for these alternatives. For the most part, these fully developed alternatives represent an array of choices that clearly could have an impact on the eventual cost and performance of the finished project.

The documented alternatives also include Design Suggestions (DS). As their name implies, these are short write-ups making note of VE perspectives on technical issues and sharing some thoughts for consideration as the design moves forward.

This introductory sheet is followed by a ***Summary of Alternatives & Design Suggestions*** table. It should be noted that the alternatives that are included, which have cost estimates attached are not necessarily representative of the final cost outcome for each alternative. Some of these alternatives have components that are mutually exclusive so they may not be added together.

The users of this report are asked to consider these alternatives and design suggestions as a smorgasbord of choices for selection and use as the project moves forward. The following *Summary of Alternatives & Design Suggestions* may also be used as a "score sheet" within the bounds of an implementation meeting.

Cost Calculations

The cost calculations are intended only as a guide to the approximate results that might be expected from implementation of the alternatives. They should be helpful in making clear choices as to the pursuit of individual alternatives.

A composite mark-up of 10% for the construction cost comparisons was derived from the cost estimate for the project. This estimate can be found in the section of this report entitled ***Project Description.***

SUMMARY OF ALTERNATIVES & DESIGN SUGGESTIONS

Georgia Department of Transportation

US441/SR 24- Morgan/Putnam Counties -EDS-441(44)(45) - P.I. No. 222570 & 222580

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DR-5	Reduce cross drains	DS

SUMMARY OF ALTERNATIVES & DESIGN SUGGESTIONS

Georgia Department of Transportation

US441/SR 24- Morgan/Putnam Counties -EDS-441(44)(45) - P.I. No. 222570 & 222580

Alternative Number	Description of Alternative	Initial Cost Savings
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Value Analysis Design Alternative

PBS&J

PROJECT:	**Georgia Department of Transportation –EDS-441(45) US441/SR 24 –Putnam County– P.I. No 222580**	ALTERNATIVE NO.:	**RD-1**
DESCRIPTION:	**REDUCE MEDIAN WIDTH TO 32' TO REDUCE RIGHT-OF-WAY**	SHEET NO.:	1 of 4

Original Design:

The original design calls for a 44 ft grassed depressed median for rural sections of this project.

Alternative:

Table 6.3 GDOT Design Standards for Arterial Roadways of the GDOT Design Policy Manual allows a 32 to 44 ft depressed median for a 4-lane divided rural arterial with a 70 mph design speed.

Opportunities:

- ROW cost savings
- Earthwork cost savings

Risks:

- Moderate design impacts

Technical Discussion:

Reduction of median width from 44 ft to 32 ft would result in cost savings for ROW acquisition as well as savings on earthwork costs.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 512,862	$	$ 512,862
ALTERNATIVE	$ 0	$	$ 0
SAVINGS	$ 512,862	$	$ 512,862

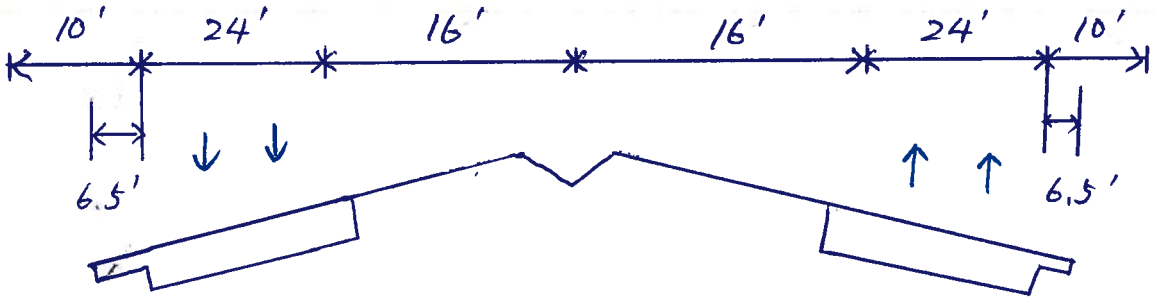
PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **RD-1**

DESCRIPTION: **REDUCE MEDIAN WIDTH TO 32' TO REDUCE RIGHT-OF-WAY**

SHEET NO.: **2** of 4

Typical Section



Calculations

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **RD-1**

DESCRIPTION: **REDUCE MEDIAN WIDTH TO 32' TO REDUCE RIGHT-OF-WAY**

SHEET NO.: 3 of 4

ROW Reduction

Station		Length
From	To	
300+00	784+09	48,409 ft

Median width reduced from 44 ft to 32 ft

A 12 ft reduction

Total ROW reduction = $12 \times 48409 = 580,908$ ft^2

$= 13.34$ AC

Earthwork Reduction

Average roadway width 210 ft

12 ft reduction equals to 5.7% reduction

Total project cut is 350,000 CY

Cut reduction is $350,000$ CY $\times 5.7\% = 19,950$ CY

Total project fill is 450,000 CY

Fill reduction is $450,000$ CY $\times 5.7\% = 25,650$ CY

COST WORKSHEET

PROJECT: **Georgia Department of Transportation-EDS-441(45)** ALTERNATIVE NO.: **RD-1**

US441/SR24 -Putnam County- P.I. No.: 222580

DESCRIPTION: ***Reduce median width to 32' to reduce Right-Of-Way*** SHEET NO.: 4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
ROW Reduction	Acres	13.34	$ 8,245.00	$109,988	0	$ 8,245.00	$0
Cut Reduction	CY	19,950	$ 5.00	$99,750	0	$ 5.00	$0
Fill Reduction	CY	25,650	$ 10.00	$256,500	0	$ 10.00	$0
* The original estimate number of units represents deleting 16' from the ROW and earthwork.							
Sub-total				$466,238			$0
Mark-up at 10.00%				$46,624			$0
TOTAL				**$512,862**			**$0**

Value Analysis Design Alternative

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441(45) US441/SR 24 –Putnam County– P.I. No 222580**

ALTERNATIVE NO.: **RD-4**

DESCRIPTION: **RE-ALIGN ROADWAY TO REDUCE REQUIRED RIGHT OF WAY.**

Original Design:

~Station 330+00 to Station 430+00-
The original design introduces a curve @ PI 325+24.45 with a forward tangent that pushes the new construction further away from the existing roadway. This alignment was developed with the intent of missing the historical structure @ ~Station 389+00 left.

~Station 700+00 to Station 750+00-
The original design replaces three horizontal curves and two tangents with two curves and a single tangent.

Alternative:

~Station 330+00 to Station 430+00-
The alternative design would propose realigning this section to be more "parallel" to the existing roadway.

~Station 700+00 to Station 750+00-
The alternative design would propose realigning this section by replacing the two curves and tangent section with a compound curve.

Opportunities:

- Reduce the required Right of Way
- Improve constructability.

Risks:

- Significant increase in design effort.

Technical Discussion:

Modification of the alignment should allow for utilizing a greater amount of the existing Right of Way. It would also improve constructability due to the fact that it reduces the amount of overlap of the proposed roadway and the existing roadway.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 93,688	$ 0	$ 93,688
ALTERNATIVE	$ 0	$ 0	$ 0
SAVINGS	$ 93,688	$ 0	$ 93,688

Illustrations

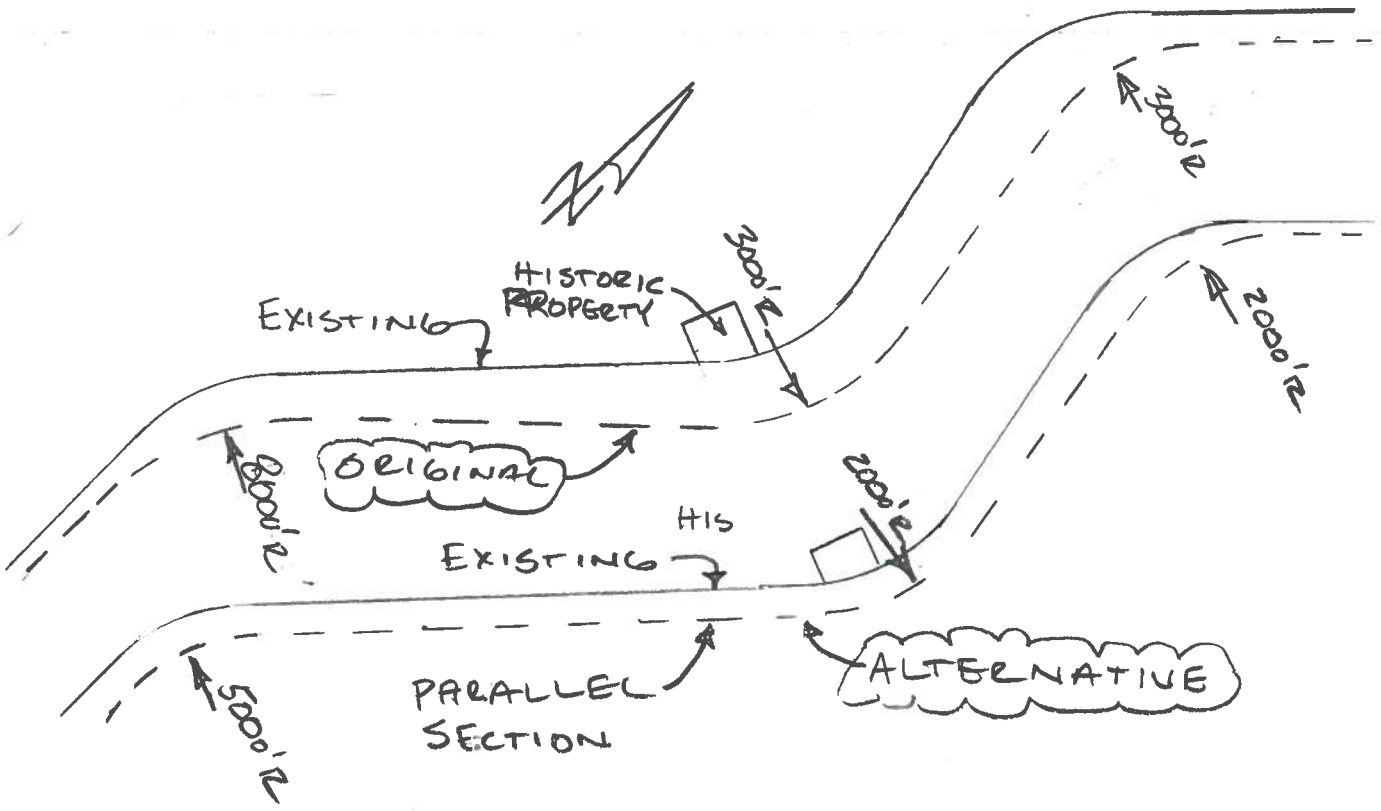
PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **RD-4**

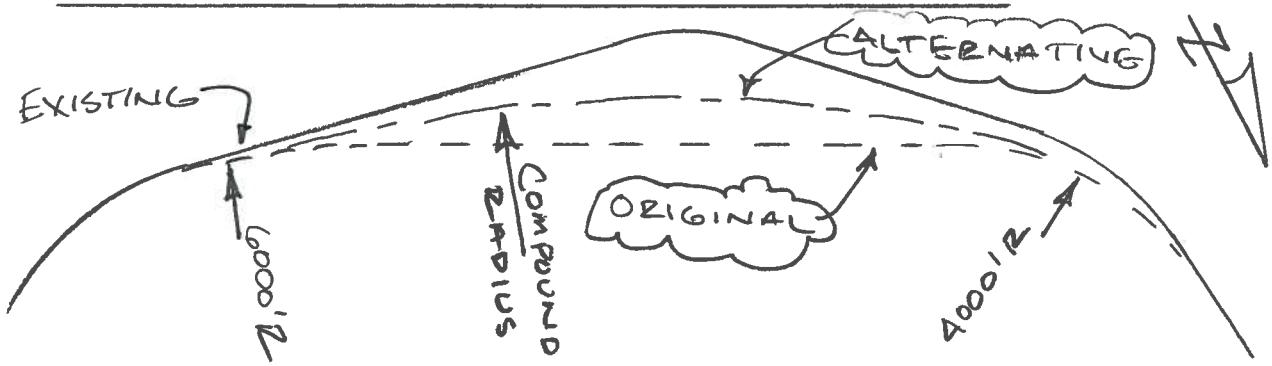
DESCRIPTION: **REALIGN ROADWAY TO REDUCE REQUIRED RIGHT OF WAY.**

SHEET NO.: 2 of 4

STATION 330+00 TO 430+00



STATION 700+00 TO 750+00



Calculations

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **RD-4**

DESCRIPTION: **RE-ALIGN ROADWAY TO REDUCE REQUIRED RIGHT OF WAY.**

SHEET NO.: 3 of 4

ASSUMPTIONS:

- Average width reduction 30'

RIGHT OF WAY REDUCTION:

Station 430+00 – 330+00 = 10,000 ft
Station 750+00 – 700+00 = 5,000 ft
15,000 ft

(30' X 15,000') / (43,560 sf / acre) => 10.33 acres

COST WORKSHEET

PROJECT: **Georgia Department of Transportation-EDS-441(45)** ALTERNATIVE NO.: **RD-4**

US441/SR24 -Putnam County: P.I. No.: 222580

DESCRIPTION: ***Re-align roadway to reduce required Right-of-Way*** SHEET NO.: 4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Right of Way	acre	10.33	$ 8,245.00	$85,171	0	$ 8,245.00	$0
Sub-total				$85,171			$0
Mark-up at 10.00%				$8,517			$0
TOTAL				**$93,688**			**$0**

Value Analysis Design Suggestion

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 – Putnam County – P.I. No 222580

ALTERNATIVE NO.: **RD-5**

DESCRIPTION: **UTILIZE RIGHT-OF-WAY FOR SEDIMENTATION BASINS**

Original Design:

The original design calls for the construction of Sedimentation Basins in additional right of way areas.

Alternative:

The alternative suggestion is to construct the basins within the proposed right of way area.

Opportunities:

- Reduce the required right of way.
- Reduce the initial construction cost.
- Provide for sedimentation removal after initial construction.

Risks:

- May require additional engineering costs.

Technical Discussion:

It appears reasonable that the proposed sedimentation basins may be constructed within the proposed right of way.

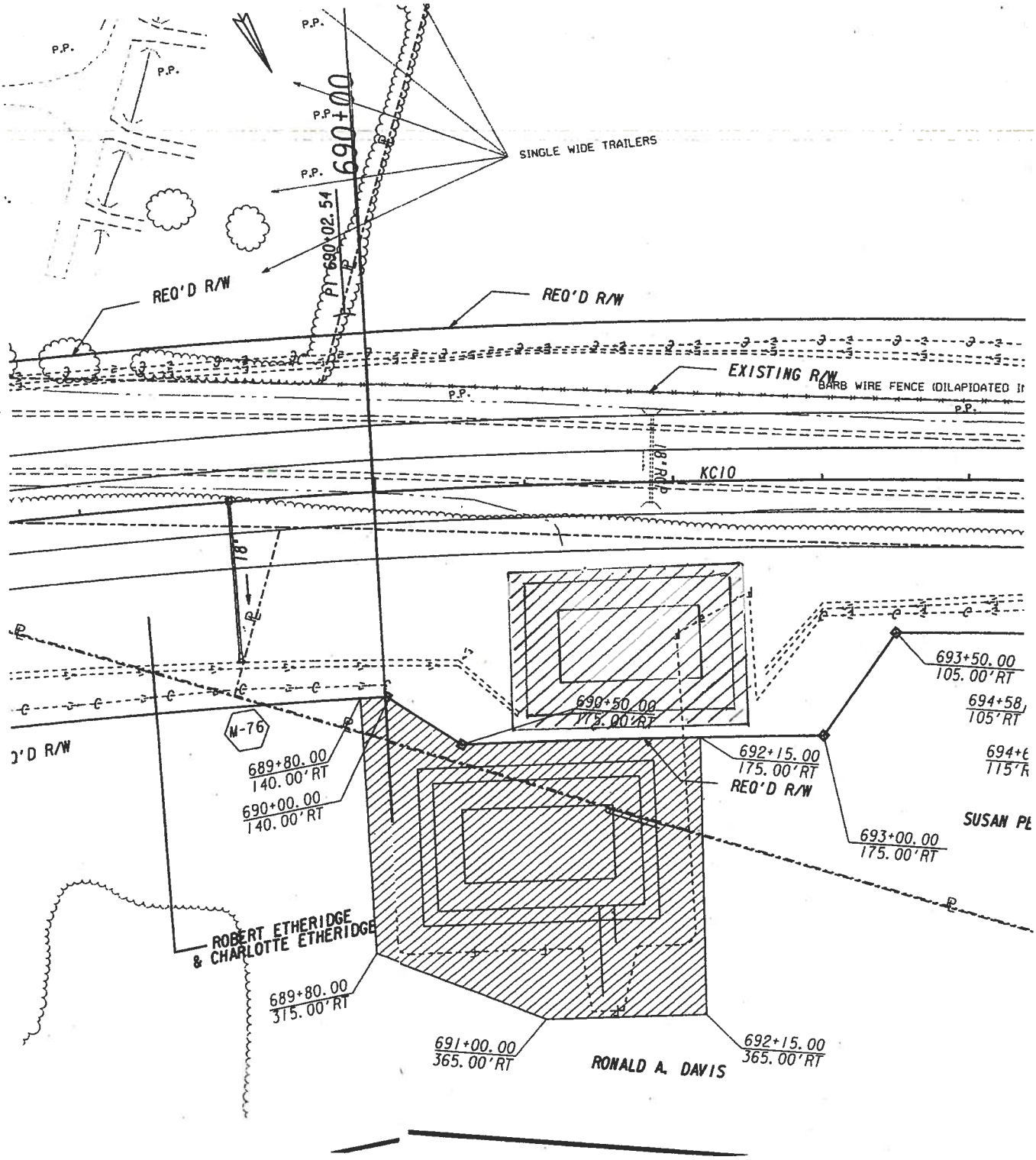
Illustration

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 – Putnam County – P.I. No 222580

ALTERNATIVE NO.: **RD-5**

DESCRIPTION: **UTILIZE RIGHT-OF-WAY FOR SEDIMENT BASINS**

SHEET NO.: 2 of 2



Value Analysis Design Suggestion

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 – Putnam County – P.I. No 222580

ALTERNATIVE NO.: **RD-6**

DESCRIPTION: **UTILIZE RIGHT-OF-WAY TO CONSOLIDATE DRIVEWAYS**

Original Design:

The original design allows all properties abutting US 441/SR 24 to have a direct access to the highway, which results in a series of dense driveways on some sections of the highway. For examples, there are eleven (11) driveways on the west side of the highway from station 304+00 to 319+00, or approximately 135 ft per driveway.

Alternative:

Some of the dense driveways could be consolidated utilizing the space from the right-of-way line to the top point of the back slope. An example illustrating the driveway consolidation for the section from station 304+00 to 319+00 is shown on the Illustration sheet on the next page. In this example, the first driveway at station 304+00 is eliminated as the property served by this driveway has a second access to Sherwood Avenue. Similarly, the 11th driveway at station 319+00 is also eliminated as the property can have an access to the existing Reid Road or a dirt road on the back of the property. The remaining 9 driveways are connected to an access road placed in front of the right-of-way line with one common driveway connecting to US 441/SR 24 at station 316+00.

Opportunities:

- Enhance safety

Risks:

- May slightly increase construction costs

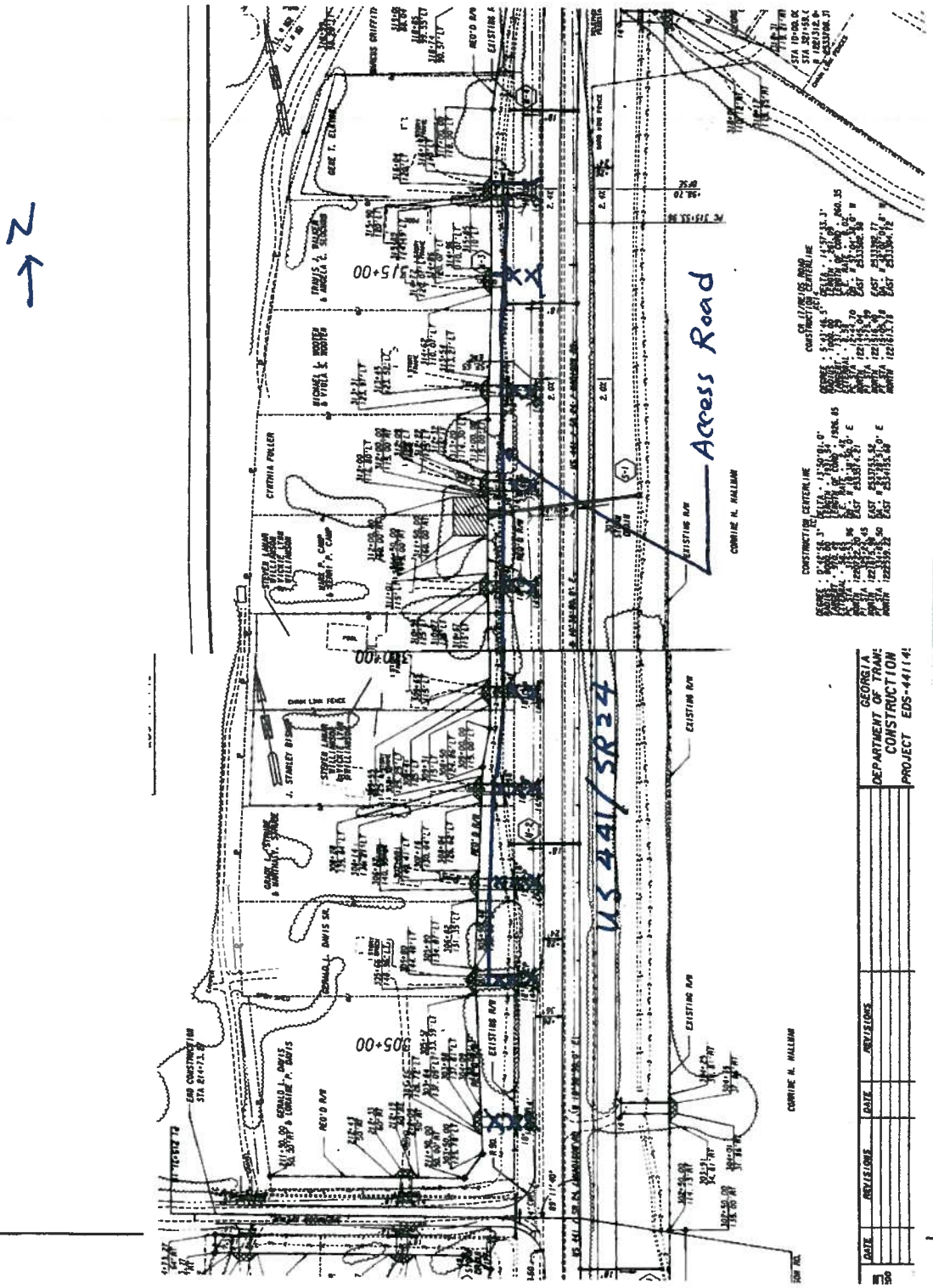
Technical Discussion:

Access management is an important strategy to enhance the safety of traffic operations on highways, especially high speed highways. The general premise is fewer driveways better safety.

Illustrations

PBS&J

PROJECT:	**Georgia Department of Transportation –EDS-441(45)** **US441/SR 24 –Putnam County– P.I. No 222580**	ALTERNATIVE NO.: **RD-6**
DESCRIPTION:	**UTILIZE RIGHT-OF-WAY TO CONSOLIDATE DRIVEWAYS**	SHEET NO.: **2** of **2**



Value Analysis Design Alternative

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441-(45)**
US441/SR 24 –Putnam – P.I. No 222580

ALTERNATIVE NO.: **RD-7**

DESCRIPTION: **USE RAP FROM EXISTING ROADWAY**

SHEET NO.: 1 of 4

Original Design:

The original design made no provisions for the possible use of recycled asphalt pavement or GAB obtained from removal or abandonment of sections of the existing roadway.

Alternative:

The alternative would be to mill this material and to reuse as part of the new pavement.

Opportunities:

- May serve to reduce pavement costs
- Reduces the amount of material to be hauled

Risks:

- Will require contractor action

Technical Discussion:

An alternate use for the existing roadway is not addressed in the plans or the estimate. With the large quantity of GAB and ACP required for the construction of the project, use of recycled pavement should result in significant cost savings.

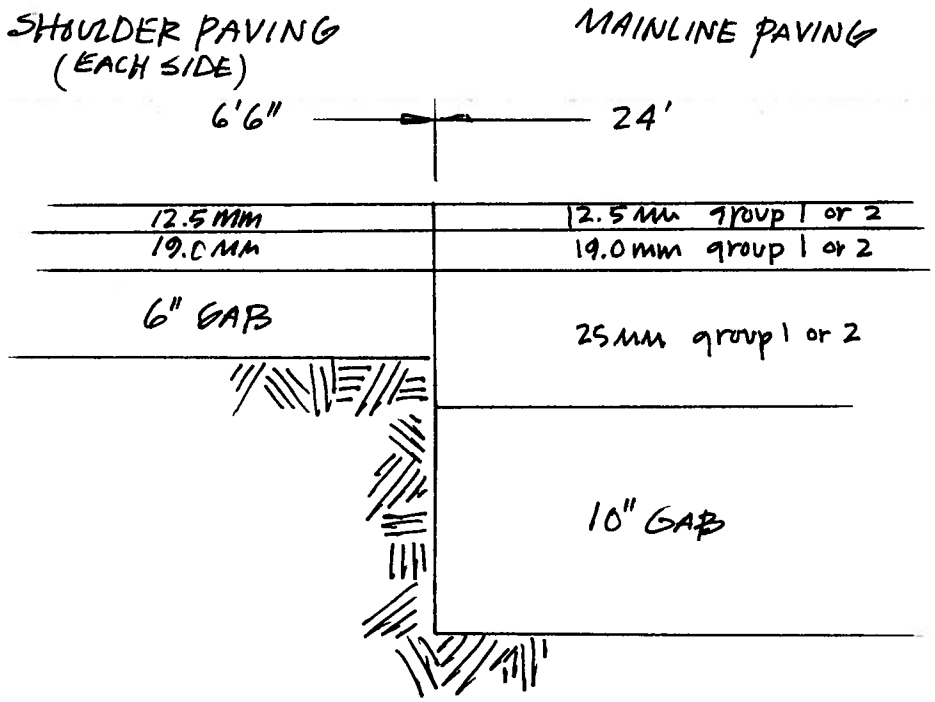
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 6,495,368	$ 0	$ 6,495,368
ALTERNATIVE	$ 5,309,730	$ 0	$ 5,309,730
SAVINGS	$ 1,185,638	$ 0	$ 1,185,638

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **RD-7**

DESCRIPTION: **USE RAP FROM EXISTING ROADWAY**

SHEET NO.: 2 of 4



EXISTING ROADWAY BEGINS STA 300+00.00
ENDS STA 784+09.79

48,409.79 LF

Calculations

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **RD-7**

DESCRIPTION: **USE RAP FROM EXISTING ROADWAY**

SHEET NO.: 3 of 4

EXISTING ROADWAY BEGINS STA 300+00.00
ENDS STA 784+09.79 48,409.79 LF

MAINLINE

USING 48,410 LF @ 24' WIDTH = 1,161,840 SF OR 129,093 SY

12.5 MM – 129,093 SY @ 165#/SY = 21,300,345# = 10,650 TN
19.0 MM – 129,093 SY @ 220#/SY = 28,400,460# = 14,200 TN
25.0 MM – 129,093 SY @ 550#/SY = 71,001,150# = 35,500 TN
60,350 TN

		ORIGINAL	ALTERNATE	#
10,650 TN	12.5 MM	@ 80.00/TN = 852,000	@ 69.44/TN = 739,536	(112,464)
14,200 TN	19.0 MM	@ 80.00/TN = 1,136,000	@ 65.49/TN = 929,958	(206,042)
35,500 TN	25.0 MM	@ 80.00/TN = 2,840,000	@ 63.47/TN = 2,253,185	(586,815)
				(905,321)

SHOULDER

48,410 LF both sides = 96,819 LF of 6'6" shoulder
= 629,327 SF OR 69,925 SY

12.5 MM – 69,925 SY @ 165#/SY = 11,537,667# = 5,769 TN
19.0 MM – 69,925 SY @ 220#/SY = 15,383,500# = 7,692 TN
13,461 TN

				#
5,769 TN	12.5 MM	@ 80.00/TN = 461,520	@ 69.44/TN = 400,595	(60,921)
7,692 TN	19.0 MM	@ 80.00/TN = 615,360	@ 65.49/TN = 503,749	(111,611)
				(172,532)

TOTAL MAINLINE + SHOULDER
905,321 + 172,532 = 1,077,853 #

COST WORKSHEET

PROJECT: **Georgia Department of Transportation-EDS-(45)** ALTERNATIVE NO.: **RD-7**

US441/SR24 -Putnam - P.I. No.: 222580

DESCRIPTION: **USE RAP FROM EXISTING ROADWAY** SHEET NO.: 4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE*			PROPOSED ESTIMATE*		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
MAINLINE							
12.5 mm recycled asph conc	TN	10,650	$ 80.00	$852,000	10,650	$ 69.44	$739,536
19.0 mm recycled asph conc	TN	14,200	$ 80.00	$1,136,000	14,200	$ 65.49	$929,958
25.0 mm recycled asph conc	TN	35,500	$ 80.00	$2,840,000	35,500	$ 63.47	$2,253,185
SHOULDER							
12.5 mm recycled asph conc	TN	5,769	$ 80.00	$461,520	5,769	$ 69.44	$400,599
19.0 mm recycled asph conc	TN	7,692	$ 80.00	$615,360	7,692	$ 65.49	$503,749
* The quantities represented are an estimate of the quantity of existing material which could be reprocessed and reused.							
	Sub-total			$5,904,880			$4,827,027
Mark-up at	**10.00%**			$590,488			$482,703
	TOTAL			**$6,495,368**			**$5,309,730**

Value Analysis Design Alternative

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441- (45)**
US441/SR 24 -Putnam County – P.I. No 222580

ALTERNATIVE NO.: **RD-8**

DESCRIPTION: **RETAIN EXISTING PAVEMENT**

SHEET NO.: 1 of 4

Original Design:

The original design made no provisions for the possible use of existing roadway sections.

Alternative:

The alternative would be to utilize existing roadway where alignment and profile permit.

Opportunities:

- May serve to reduce pavement costs
- Reduces the amount of material to be hauled

Risks:

- May require additional site testing and design changes

Technical Discussion:

An alternate use for the existing roadway is not addressed in the plans or the estimate. Where the existing alignment runs concurrent with the new alignment such as from STA 430+00 to STA 465+00 and the profile will permit, the existing roadway could remain which should result in significant savings.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 373,111	$	$ 373,111
ALTERNATIVE	$ 0	$	$ 0
SAVINGS	$ 373,111	$	$ 373,111

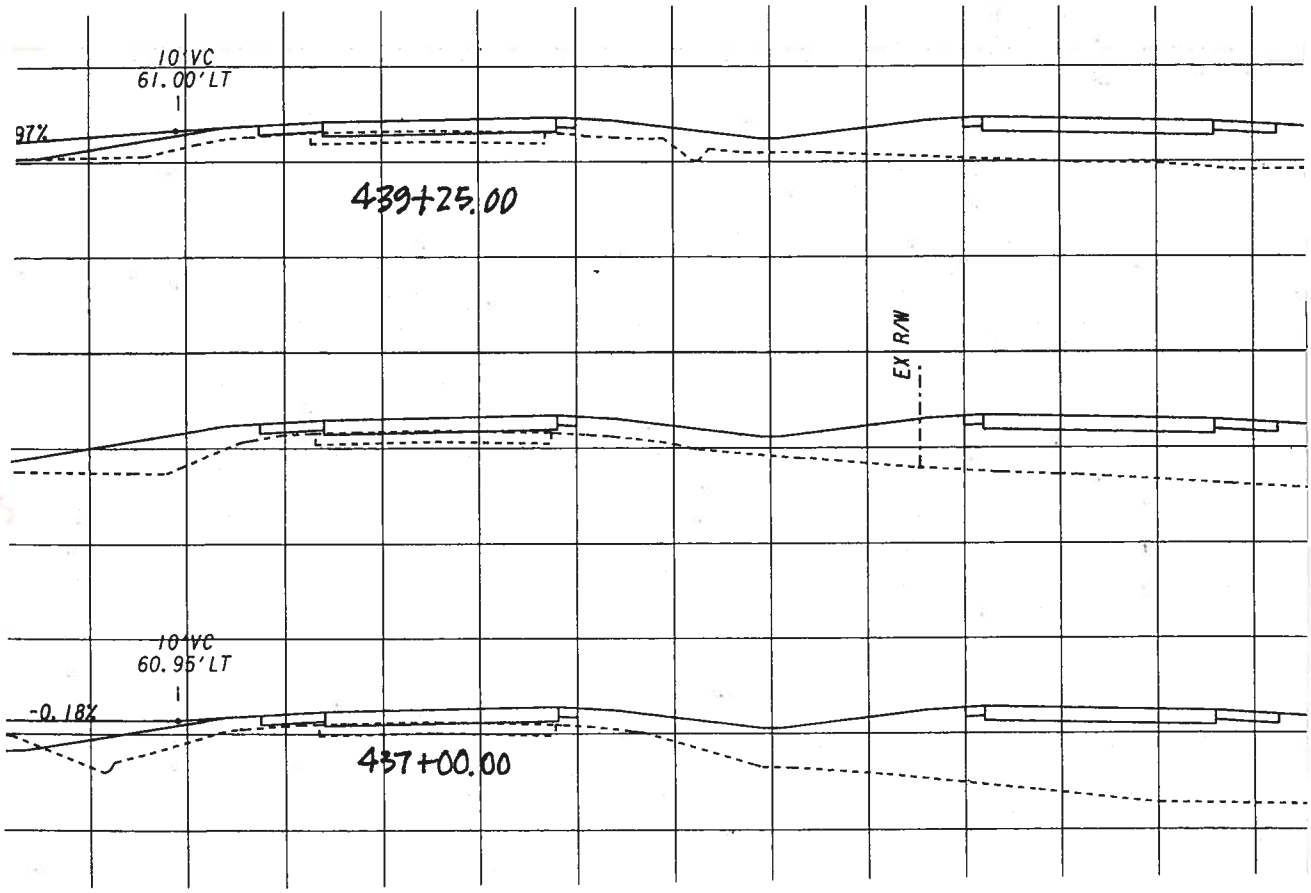
Illustrations

PROJECT: **Georgia Department of Transportation –EDS-(45)**
US441/SR 24 – Putnam – P.I. No 222580

ALTERNATIVE NO.: **RD-8**

DESCRIPTION: **RETAIN EXISTING PAVEMENT**

SHEET NO.: 2 of 4



WHERE THE EXISTING ALIGNMENT RUNS CONCURRENT WITH THE NEW ALIGNMENT SUCH AS FROM STA 430+00 to STA 465+00 AND THE PROFILE WILL PERMIT, THE EXISTING ROADWAY COULD REMAIN WHICH SHOULD RESULT IN SIGNIFICANT SAVINGS.

'D" GAB SAVINGS

STA 430+00 to STA 465+00 = 3,500 LF X 24' PAVEMENT WIDTH
= 84,000 SF OR 9,333 SY
USING THE MEAN FOR GR AGGR BASE CRS, 10 INCH, INCL MATL = $24.00/SY
OR $223,992.

STA 300+00 to STA 318+00 = 1,800 LF X 24' PAVEMENT WIDTH
= 43,200 SF OR 4,800 SY
@ $24.00/SY = $115,200.

TOTAL GAB SAVINGS = $339,192.

COST WORKSHEET

PBSJ

PROJECT: **Georgia Department of Transportation-EDS-(45)** ALTERNATIVE NO.: **RD-8**

US441/SR24 -Putnam - P.I. No.: 222580

DESCRIPTION: **RETAIN EXISTING PAVEMENT** SHEET NO.: 4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
10" GAB	SY	14,133	$ 24.00	$339,192	0	$ 24.00	$0
Sub-total				$339,192			$0
Mark-up at	**10.00%**			$33,919			$0
TOTAL				**$373,111**			**$0**

Value Analysis Design Alternative

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441(45) US441/SR 24 –Putnam County– P.I. No 222580**

ALTERNATIVE NO.: **RD-10**

DESCRIPTION: **RELOCATE HARMONY RD TO MINIMIZE NEW CONSTRUCTION**

SHEET NO.: 1 of 4

Original Design:

Harmony Road (CR 218) currently meets US 441/SR 24 at station 603+49 from the east with a very small angle. The original design realigns Harmony Road to meet US 441/SR 24 at station 619+48 with a near 90 degree angle, resulting the construction of a 1,700 ft section of the re-aligned Harmony Road.

Alternative:

The alternative is to realign Harmony Road to meet US 441/SR 24 at station 612+80 with a 90 degree angle, which will require the construction of a 500 ft section of the re-aligned Harmony Road.

Opportunities:

- Reduce Right-of-Way
- Reduce construction cost
- Improve traffic operations

Risks:

- Re-alignment will require minimum or no additional effort in roadway design as it is currently in the concept phase.

Technical Discussion:

1. Under the original design, the re-aligned Harmony Road will create a new intersection with a no name road running north and south connecting Harmony Road and US 441/SR 41 at station 636+50. The alternative will eliminate this new intersection.

2. Under the original design, the re-aligned Harmony Road will have a 500 ft spacing between US 441/SR 24 and the intersection with the no name road. This spacing will slightly reduce to 400 ft under the alternative.

3. Under the original design, the re-aligned Harmony Road will meet the existing Harmony Road with a sharp angle approximately 30 degrees. This intersection angle will be improved to approximately 50 degrees under the alternative.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 255,200	$	$ 255,200
ALTERNATIVE	$ 0	$	$ 0
SAVINGS	$ 255,200	$	$ 255,200

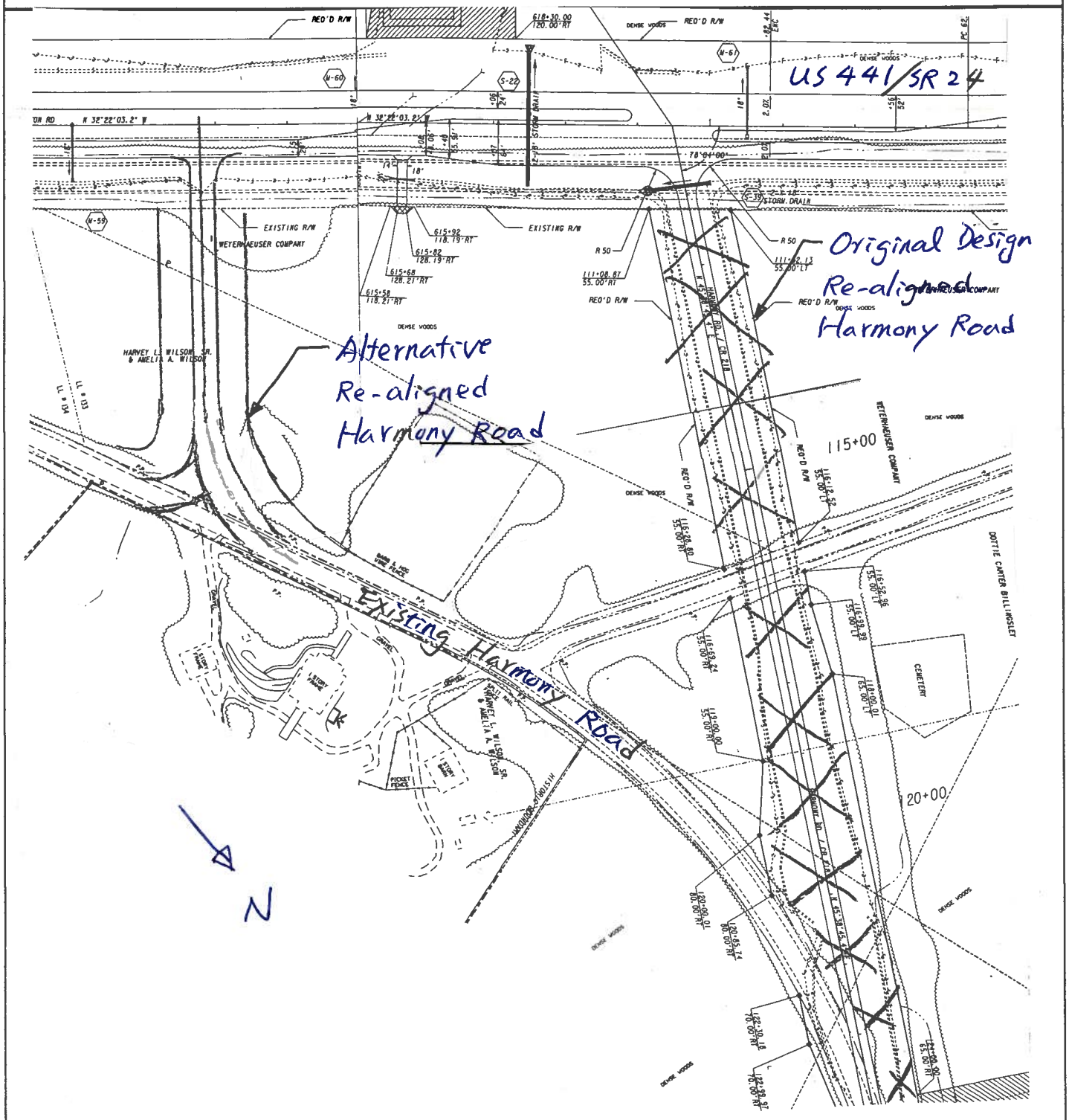
Illustrations

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **RD-10**

DESCRIPTION: **RELOCATE HARMONY RD TO MINIMIZE NEW CONSTRUCTION**

SHEET NO.: **2** of 4



ROW Reduction

Original Design ROW

$= 110' \times 780' + 140' \times 190' + \frac{140' + 160'}{2} \times 300' = 142,400\ ft^2$

Alternative ROW

$= 110' \times 330' + \frac{110' \times 50'}{2} = 39,050\ ft^2$

ROW reduction $= 142,400\ ft^2 - 39,050\ ft^2 = 103,350\ ft^2$
$= 2.37\ AC$

Construction Area Reduction

Original Design Construction area

$= 24' \times 1350' = 32,400\ ft^2 = 3,600\ SY$

Alternative construction area

$= 24' \times 500' = 12,000\ ft^2 = 1,330\ SY$

Construction area reduction $= 3600\ SY - 1330\ SY$
$= 2,270\ SY$

Estimation of Unit Cost for Side Street Construction:

① $165\#/2000\#/SY @ \$80 = \$6.60$

② $220\#/2000\#/SY @ \$80 = \$8.80$

③ $550\#/2000\#/SY @ \$80 = \$22$

④ GAB $10''/12 \times 9\ SF/SY\ 135\# \times \$21/TON = \$10.63$

total $\$48.03$ use $\$50.-$

COST WORKSHEET

PBSJ

PROJECT: **Georgia Department of Transportation-EDS-441(45)** ALTERNATIVE NO.: **RD-10**

US441/SR24 -Putnam County- P.I. No.: 222580

DESCRIPTION: ***Relocate Harmony Rd. to minimize new construction*** SHEET NO.: 4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
ROW Reduction	Acre	2.37	$ 50,000.00	$118,500	0	$ 50,000.00	$0
Construction Cost Reduction	SY	2270	$ 50.00	$113,500	0	$ 50.00	$0
*Number of Units to eliminated							
Sub-total				$232,000			$0
Mark-up at 10.00%				$23,200			$0
TOTAL				**$255,200**			**$0**

Value Analysis Design Suggestion

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 – Putnam County – P.I. No 222580

ALTERNATIVE NO.: **RD-11**

DESCRIPTION: **ADJUST THE BETHEL CHURCH ROAD REALIGNMENT TO ENHANCE THE SAFETY OF TRAFFIC OPERATIONS**

Original Design:

Bethel Church Road (CR 147) currently meets US 441/SR 24 at station 489+50 from the east with a small angle approximately 30 degrees. The original design realigns Bethel Church Road to meet US 441/SR 24 at station 781+00 with a near 90 degree angle. The original design, however, allows the existing Bethel Church Road to meet the re-aligned Bethel Church at a small angle, approximately 30 degrees.
The re-aligned Bethel Church Road will create a new intersection with a no name road connecting Bethel Church Road to the south.

Alternative:

The alternative is to

(1) Delete a section of the existing Bethel Church Road requiring the existing Bethel Church Road to access the re-aligned Bethel Church Road thru the new intersection created by the re-aligned Bethel Church Road and the no name road.

(2) Change the existing Bethel Church Road and US 441/SR 24 intersection to a cul-de-sac.

Opportunities:

- Enhance safety

Risks:

Technical Discussion:

Intersections with a sharp angle less than 60 degrees pose a hazard potential to motorists. They should be avoided whenever possible.

Illustrations

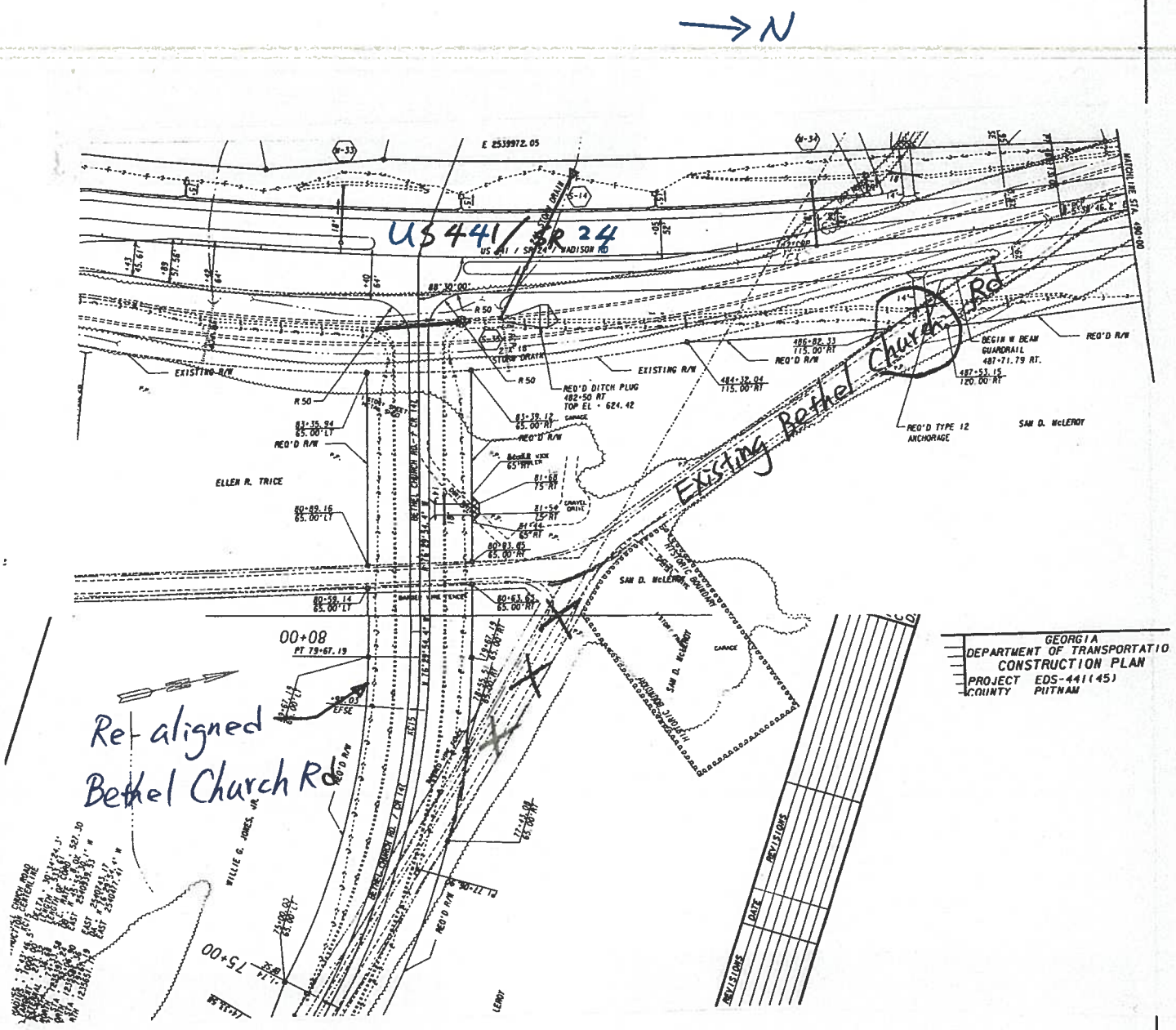
PBSJ

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **RD-11**

DESCRIPTION: **ADJUST THE BETHEL CHURCH ROAD REALIGNMENT TO ENHANCE THE SAFETY OF TRAFFIC OPERATIONS**

SHEET NO.: 2 of 2



Value Analysis Design Suggestion

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 – Putnam County – P.I. No 222580

ALTERNATIVE NO.: **RD-12**

DESCRIPTION: **ADJUST THE PRICE ROAD REALIGNMENT TO ENHANCE THE SAFETY OF TRAFFIC OPERATIONS**

Original Design:

Price Road (CR 1) currently meets US 441/SR 24 at station 761+00 from the west with a very small angle. The original design realigns Price Road to meet US 441/SR 24 at station 749+00 with a larger angle near 75 degrees. The original design, however, allows the existing Price Road to meet the re-aligned Price at a small angle, approximately 30 degrees.

Alternative:

The alternative is to

(1) Realign Price Road to meet US 441/SR 24 at station 746+00 with a near 90 degree angle.

(2) Realign the existing Priced Road to meet the re-aligned Price Road at a near 90 degree angle.

(3) Change the existing Price Road and US 441/SR 24 intersection to a cul-de-sac.

Opportunities:

- Enhance safety

Risks:

- Increase ROW
- Increase construction costs

Technical Discussion:

Intersections with a sharp angle less than 60 degrees pose a hazard potential to motorists. They should be avoided whenever possible.

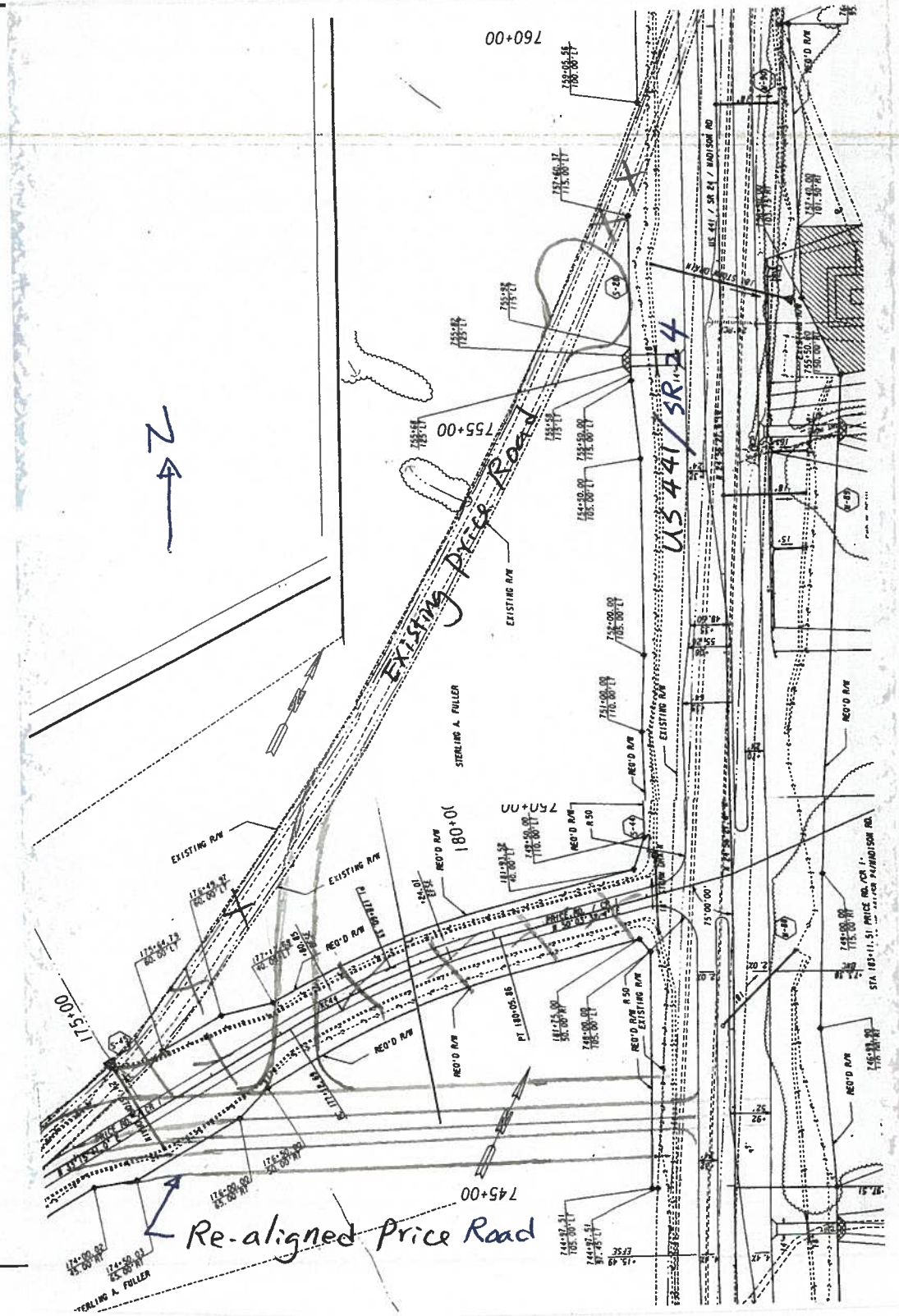
Illustrations

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **RD-12**

DESCRIPTION: **ADJUST THE PRICE ROAD REALIGNMENT TO ENHANCE THE SAFETY OF TRAFFIC OPERATIONS**

SHEET NO.: 2 of 2



Value Analysis Design Alternative

PROJECT: **Georgia Department of Transportation –EDS-441(45) US441/SR 24 –Putnam County– P.I. No 222580**

ALTERNATIVE NO.: **EW-1**

DESCRIPTION: **VERTICALLY BIFURCATE THE ROADWAY TO REDUCE EARTHWORK.**

SHEET NO.: 1 of 4

Original Design:

The original design provides for both roadways to have a common profile grade line.

Alternative:

The alternative design proposes bifurcating the vertical alignment of the roadway and in crease the side slopes of the median to reduce the amount of borrow required to construct the roadway.

Opportunities:

- Reduce the required borrow.
- Increase/maintain median ditch capacity.

Risks:

- Moderate increase in design effort.

Technical Discussion:

A minor bifurcation (~1 foot) in conjunction with steeper side slopes in the median will allow you to lower the roadway on one side in order to reduce the required fill material.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 4,950,000	$ 0	$ 4,950,000
ALTERNATIVE	$ 4,358,200	$ 0	$ 4,358,200
SAVINGS	$ 591,800	$ 0	$ 591,800

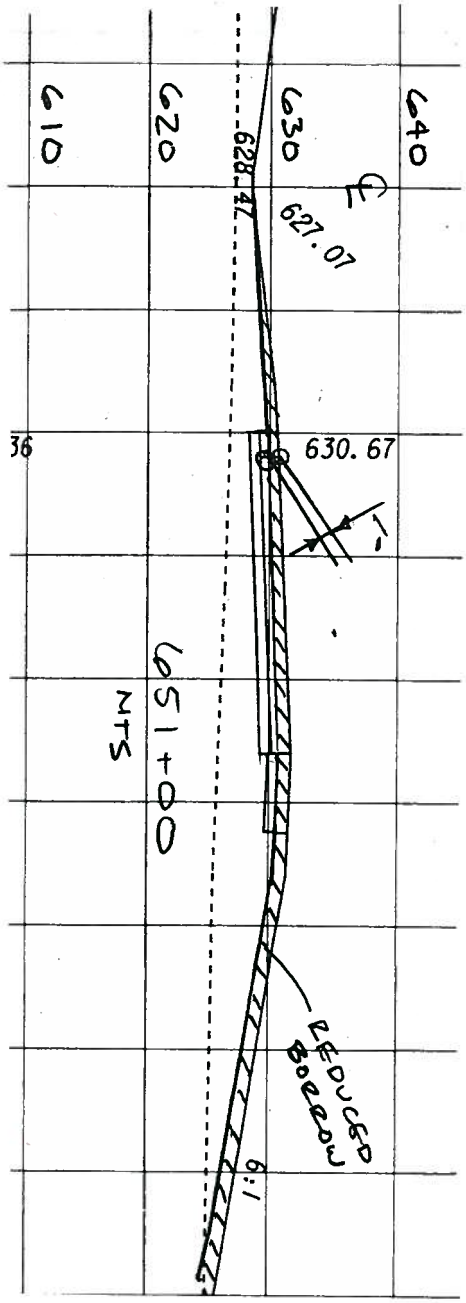
Illustrations

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **EW-1**

DESCRIPTION: **VERTICALLY BIFURCATE THE ROADWAY TO REDUCE EARTHWORK**

SHEET NO.: 2 of 4



Calculations

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **EW-1**

DESCRIPTION: **VERTICALLY BIFURCATE THE ROADWAY TO REDUCE EARTHWORK**

ASSUMPTIONS:

- Bifurcation of 1 foot
- Fill area average of 100' in width
- Fill area on 30% of the job

REDUCED FILL/BORROW:

(1' X 100') (0.30 X 48,400') / (27cf/cy) => 53,800 cy

REQUIRED BORROW:

450,000 cy – 53,800 cy => 396,200 cy

COST WORKSHEET

PBSJ

PROJECT:	Georgia Department of Transportation-EDS-441(45)	ALTERNATIVE NO.:	EW-1
	US441/SR24 -Putnam County: P.I. No.: 222580		
DESCRIPTION:	VERTICALLY BIFURCATE THE ROADWAY TO REDUCE EARTHWORK	SHEET NO.:	4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Borrow	cy	450,000	$ 10.00	$4,500,000	396,200	$ 10.00	$3,962,000
Sub-total				$4,500,000			$3,962,000
Mark-up at	10.00%			$450,000			$396,200
TOTAL				**$4,950,000**			**$4,358,200**

Value Analysis Design Alternative

PBSJ

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County – P.I. No. 222580

ALTERNATIVE NO.: **EW-2**

DESCRIPTION: **ADJUST FORE SLOPES TO REDUCE EARTHWORK AND RIGHT OF WAY**

SHEET NO.: 1 of 4

Original Design:

The original design utilizes 6:1 fore slopes on the main roadway typical sections.

Alternative:

Vary the fore slopes on the main roadway from 6:1 up to 4:1. Table 6.3 of the GDOT Design Policy Manual recommends/allows the use of 4:1 fore slopes on 4-lane rural arterials. The Project Concept Report (PI-222580) also recommends/allows the use of 4:1 fore slopes. Consideration should also be given to utilizing an "umbrella section" (increasing the fore slope to 3:1 outside the clear zone).

Opportunities:

- Reduce earthwork / improve earthwork balance
- Reduce required Right of Way
- Deepen ditches / raise the roadway to provide more ditch capacity and reduce the potential of inundating the roadway base

Risks:

- Significant increase in design effort.
-

Technical Discussion:

The selective use of a combination of 4:1 and 6:1 fore slopes will allow the engineer to minimize the roadway footprint. Use of an umbrella section will allow reduction of the footprint even further.

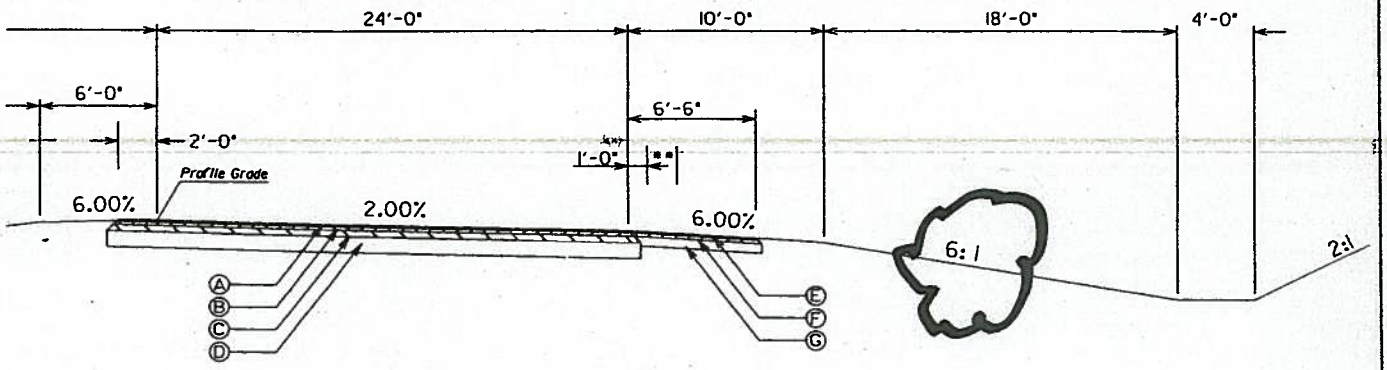
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 5,010,766	$ 0	$ 5,010,766
ALTERNATIVE	$ 4,506,150	$ 0	$ 4,506,150
SAVINGS	$ 504,616	$ 0	$ 504,616

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

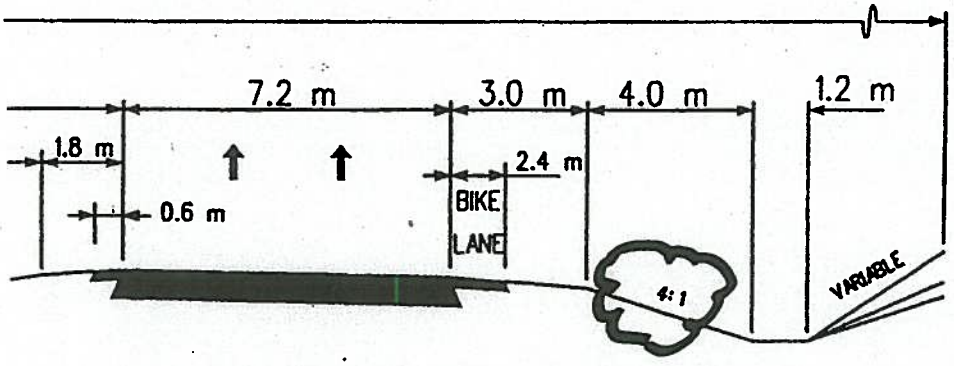
ALTERNATIVE NO.: **EW-2**

DESCRIPTION: **ADJUST FORE SLOPES TO REDUCE EARTHWORK AND RIGHT OF WAY**

SHEET NO.: 2 of 4

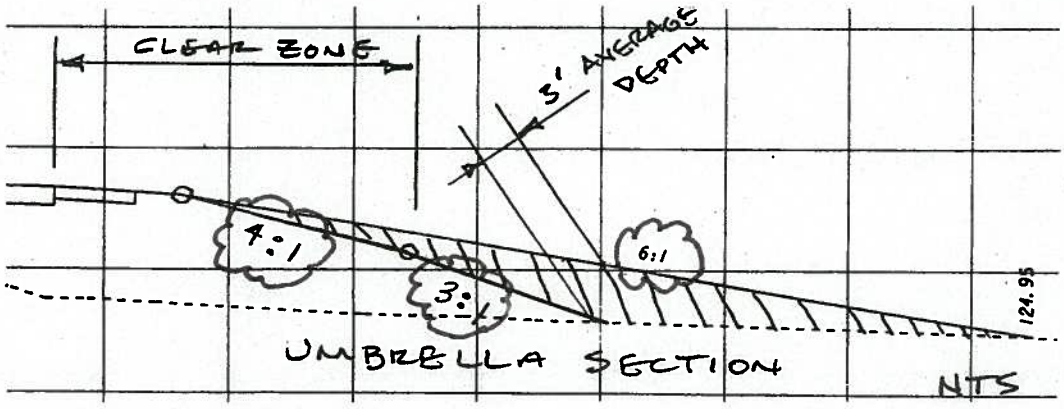


ORIGINAL DESIGN
NTS



ALTERNATIVE DESIGN

FROM CONCEPT REPORT
NTS



UMBRELLA SECTION NTS

Calculations

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **EW-2**

DESCRIPTION: **ADJUST FORE SLOPES TO REDUCE EARTHWORK AND RIGHT OF WAY**

ASSUMPTIONS:

- Average "fill slope" length => 60'
- Average maximum difference in fill depth (4:1 versus 6:1) => 3.0'
- Reduction in "footprint => 20'
- Fill area on 30% of the job

REDUCED FILL/BORROW:

[(2.5' X 60')/2] (0.30 X 48,400') / (27cf/cy) => 40,350 cy

REQUIRED BORROW:

450,000 cy – 40,350 cy => 409,650 cy

RIGHT OF WAY REDUCTION:

(20' X 0.30 X 48,400) / (43,560 sf / acre) => 6.7 acres

COST WORKSHEET

PROJECT: **Georgia Department of Transportation-EDS-441(45)** ALTERNATIVE NO.: **EW-2**

US441/SR24 -Putnam County: P.I. No.: 222580

DESCRIPTION: **ADJUST FORE SLOPES TO REDUCE EARTHWORK AND RIGHT OF WAY** SHEET NO.: 4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Borrow	cy	450,000	$ 10.00	$4,500,000	409,650	$ 10.00	$4,096,500
Right of Way	acre	6.7	$ 8,245.00	$55,242	0	$ 8,245.00	$0
Sub-total				$4,555,242			$4,096,500
Mark-up at 10.00%				$455,524			$409,650
TOTAL				**$5,010,766**			**$4,506,150**

Value Analysis Design Alternative

PROJECT:	**Georgia Department of Transportation –EDS-441(45) US441/SR 24 –Putnam County– P.I. No 222580**	ALTERNATIVE NO.:	**EW-3**
DESCRIPTION:	**ADJUST VERTICAL ALIGNMENT TO REDUCE BORROW**	SHEET NO.:	1 of 4

Original Design:

The original design provides for both roadways to have a common profile grade line.

Alternative:

The alternative design proposes lowering the design grade in selected areas where the roadway is in a fill.

Opportunities:

- Reduce the required borrow.

Risks:

- Moderate increase in design effort.

Technical Discussion:

A minor adjustment (~1 foot) lowering the roadway will allow you not only to reduce the required borrow material but will also increase your available fill from increases in excavation. This will alleviate some of the excess borrow condition existing on the project.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 4,950,000	$ 0	$ 4,950,000
ALTERNATIVE	$ 4,632,100	$ 0	$ 4,632,100
SAVINGS	$ 317,900	$ 0	$ 317,900

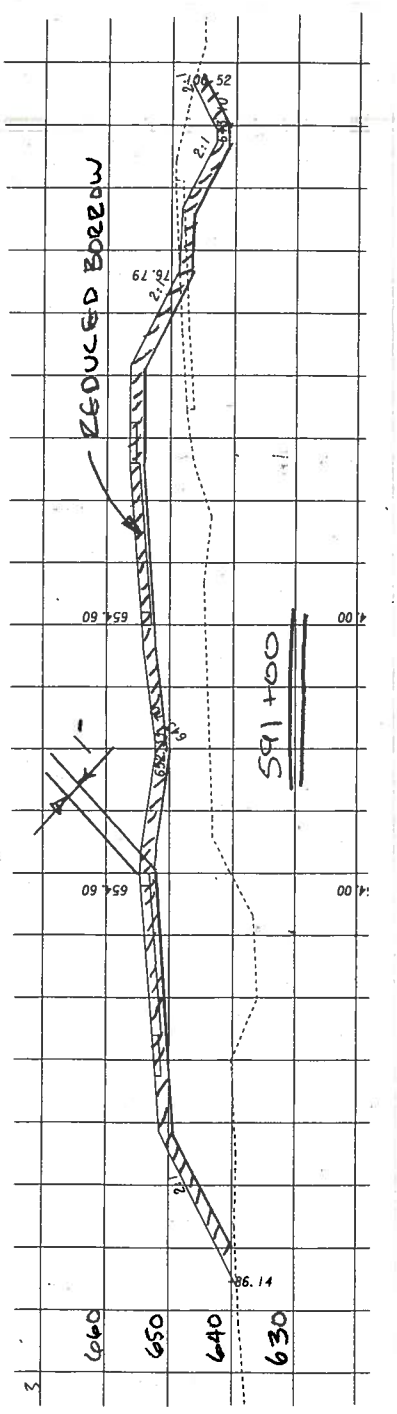
Illustrations

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **EW-3**

DESCRIPTION: **ADJUST VERTICAL ALIGNMENT TO REDUCE BORROW**

SHEET NO.: 2 of 4



PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **EW-3**

DESCRIPTION: **ADJUST VERTICAL ALIGNMENT TO REDUCE BORROW**

ASSUMPTIONS:

- Adjustment of 1 foot
- Fill area average of 120' in width
- Stations in areas of fill:

114+50 to 124+00
130+00 to 138+00
142+00 to 145+50
151+00 to 154+00
176+00 to 179+00
192+00 to 194+50
207+50 to 212+50
228+00 to 231+50
233+00 to 238+00
260+00 to 265+00
267+50 to 272+00
279+00 to 282+00
294+00 to 305+00
338+00 to 342+00
349+50 to 355+50
373+00 to 379+00
394+50 to 398+00
401+50 to 415+50
422+50 to 425+50
428+00 to 429+50
431+00 to 434+00
435+00 to 442+50
448+00 to 451+00
483+50 to 492+50
494+50 to 497+00

12,950 lf => utilize half the area 6500 lf

REDUCED FILL/BORROW:

(1' X 120'X 6500') / (27cf/cy) => 28,900 cy

REQUIRED BORROW:

450,000 cy – 28,900 cy => 421,100 cy

COST WORKSHEET

PBSJ

PROJECT:	Georgia Department of Transportation-EDS-441(45)	ALTERNATIVE NO.:	EW-3
	US441/SR24 -Putnam County: P.I. No.: 222580		
DESCRIPTION:	**ADJUST VERTICAL ALIGNMENT TO REDUCE BORROW**	SHEET NO.:	4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Borrow	cy	450,000	$ 10.00	$4,500,000	421,100	$ 10.00	$4,211,000
	Sub-total			$4,500,000			$4,211,000
Mark-up at	**10.00%**			$450,000			$421,100
	TOTAL			**$4,950,000**			**$4,632,100**

Value Analysis Design Suggestion

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 – Putnam County – P.I. No 222580

ALTERNATIVE NO.: **DR-1**

DESCRIPTION: **ROUTE MEDIAN DRAINS TO DOWNSTREAM SIDE OF THE ROADWAY.**

SHEET NO.: 1 of 1

Original Design:

The original design calls for the construction of storm drains leading from the grassed median to the outside of the pavement area. In some locations these storm drains are routing runoff to a road side swale which routes the runoff to another cross drain which carries the water to the opposite side of the roadway.

Alternative:

Construct the median storm drains such that they route the storm water to the downstream side of the roadway.

Opportunities:

- Reduce initial construction costs

Risks:

- May reduce the project risks

Technical Discussion:

By directly routing the stormwater to the ultimate disposal side of the roadway, the cross drains may be reduced in size to only handle the runoff from the adjacent area.

Value Analysis Design Suggestion

PBSJ

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 – Putnam County – P.I. No 222580

ALTERNATIVE NO.: **DR-2**

DESCRIPTION: **REDUCE/CONSOLIDATE SEDIMENT BASINS**

SHEET NO.: 1 of 1

Original Design:

The original design calls for the construction of temporary sedimentation basins. At some locations there are two or three basins either adjacent or routed to each other.

Alternative:

Combine sedimentation basins (Sta. 435+00) where reasonable to reduce the temporary easements, construction and demolition.

Opportunities:

- Reduce initial construction costs
- Reduce impact to local users

Risks:

- May reduce the project risks

Technical Discussion:

It may be reasonable to combine adjacent basins and route the stormwater to only one. It may also be possible to construct "mini" basins along the swales in-lieu of actual impoundments, thereby deleting the necessity for easements.

Value Analysis Design Suggestion

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 – Putnam County – P.I. No 222580

ALTERNATIVE NO.: **DR-3**

DESCRIPTION: **MODIFY ROW TO ACCOMMODATE OUTFALL MAINTENANCE**

SHEET NO.: 1 of 1

Original Design:

The original design calls for the construction of storm water outfalls at or near the ROW line.

Alternative:

This suggestion would be to either provide additional ROW or locate the outfall away from the ROW line to allow maintenance crews space to maintain the structures.

Opportunities:

- Reduce O & M costs
- Improve operation

Risks:

- May increase the project costs

Technical Discussion:

To properly maintain the storm water outfalls, the maintenance crews should be provide with adequate space within the ROW to clean and repair the storm drain outfalls.

Value Analysis Design Suggestion

PBSJ

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 – Putnam County – P.I. No 222580

ALTERNATIVE NO.: **DR-4**

DESCRIPTION: **RE-EVALUATE THE ELIMINATION OF OUTFALLS**

SHEET NO.: 1 of 1

Original Design:

The original design calls for the construction of stormwater outfalls at or near the ROW line.

Alternative:

This suggestion would be to either provide additional ROW or locate the outfall away from the ROW line by increasing side slopes to allow maintenance crews space to maintain the structures.

Opportunities:

- Reduce O & M costs
- Improve operation

Risks:

- May increase the project costs

Technical Discussion:

To properly maintain the stormwater outfalls, the maintenance crews should be provided with adequate space within the ROW to clean and repair the storm drain outfalls.

Value Analysis Design Suggestion

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 – Putnam County – P.I. No 222580

ALTERNATIVE NO.: **DR-5**

DESCRIPTION: **RE-EVALUATE THE ALIGNMENT OF CROSS DRAINS**

SHEET NO.: 1 of 1

Original Design:

The original design calls for the construction of cross drains to carry the stormwater under the roadway. These drains are sometimes on a very severe diagonal route.

Alternative:

This suggestion would be to review the alignment of the cross drains to determine if they could be routed more perpendicular to the roadway.

Opportunities:

- Reduce initial construction costs
- Improve operation

Risks:

- None noted.

Technical Discussion:

It may be reasonable to align the cross drains more perpendicular to the roadway to reduce the length and depths.

Value Analysis Design Alternative

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441(44) US441/SR 24 –Morgan County– P.I. No 222570**

ALTERNATIVE NO.: **RD-31**

DESCRIPTION: **RE-ALIGN ROADWAY TO REDUCE REQUIRED RIGHT OF WAY.**

SHEET NO.: 1 of 4

Original Design:

~Station 130+00 to Station 200+00-
The original design introduces a curve @ PI 152+18.12 that pushes the new construction further away from the existing roadway. This alignment was developed with the intent of missing the historical structure @ ~Station 389+00 left.

~Station 435+00 to Station 505+00-
The original design

Alternative:

~Station 130+00 to Station 200+00-
The alternative design would propose realigning this section to be more "parallel" to the existing roadway and moving the proposed curve back closer to the historical structure.

~Station 435+00 to Station 505+00-
The alternative design would propose realigning this section by replacing the two curves and tangent section with a compound curve.

Opportunities:

- Reduce the required Right of Way
- Improve Constructability.

Risks:

- Significant increase in design effort.

Technical Discussion:

Modification of the alignment should allow for utilizing a greater amount of the existing Right of Way. It would also improve constructability due to the fact that it reduces the amount of overlap of the proposed roadway and the existing roadway.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 97,044	$ 0	$ 97,044
ALTERNATIVE	$ 0	$ 0	$ 0
SAVINGS	$ 97,044	$ 0	$ 97,044

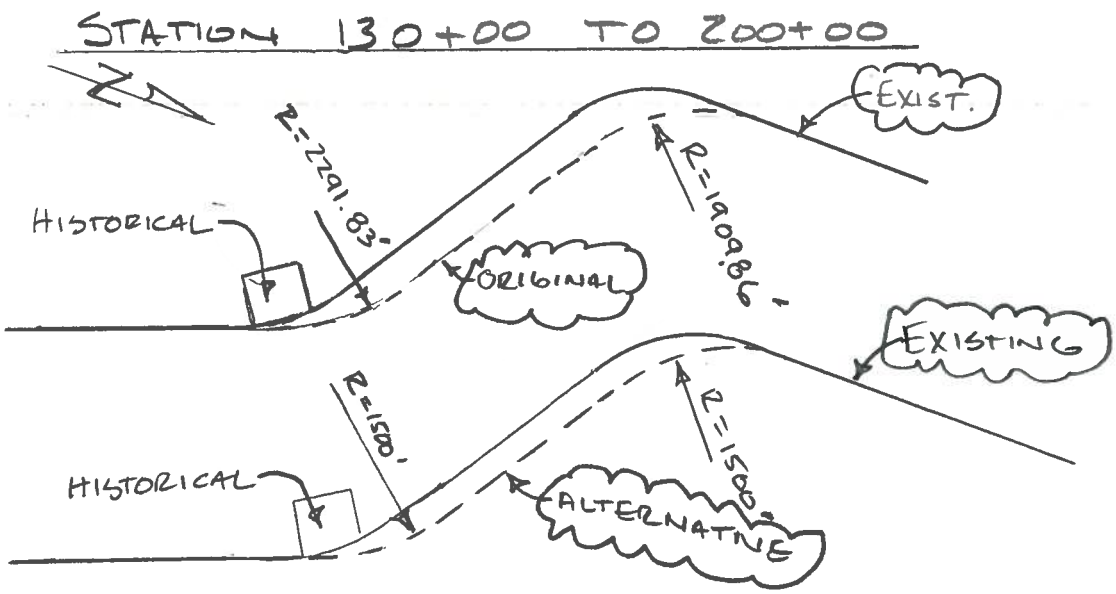
Illustrations

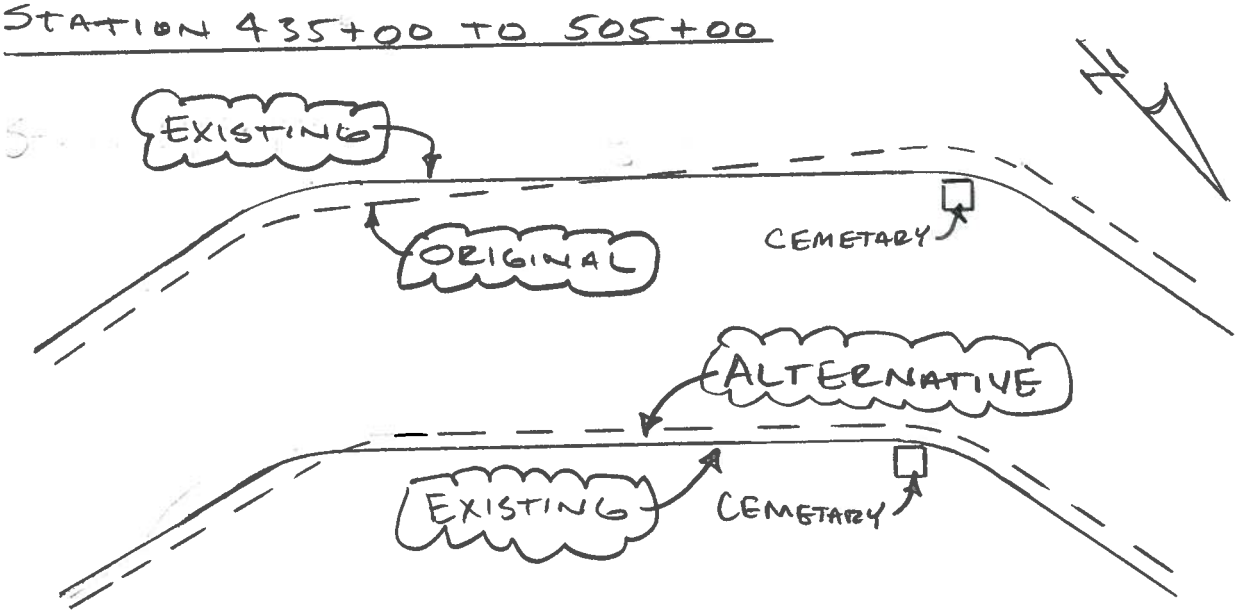
PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County– P.I. No 222570

ALTERNATIVE NO.: **RD-31**

DESCRIPTION: **REALIGN ROADWAY TO REDUCE REQUIRED RIGHT OF WAY.**

SHEET NO.: 2 of 4





Calculations

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County– P.I. No 222570

ALTERNATIVE NO.: **RD-31**

DESCRIPTION: **RE-ALIGN ROADWAY TO REDUCE REQUIRED RIGHT OF WAY.**

SHEET NO.: 3 of 4

ASSUMPTIONS:

- Average width reduction 30'

RIGHT OF WAY REDUCTION:

Station 200+00 – 130+00 = 7,000 ft
Station 505+00 – 435+00 = 7,000 ft
14,000 ft

(30' X 14,000') / (43,560 sf / acre) => 9.64 acres

COST WORKSHEET

PROJECT: **Georgia Department of Transportation-EDS-441(44)** ALTERNATIVE NO.: **RD-31**

US441/SR24 -Morgan County: P.I. No.: 222570

DESCRIPTION: **REALIGN ROADWAY TO REDUCE REQUIRED RIGHT OF WAY** SHEET NO.: 4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Right of Way	acre	10.70	$ 8,245.00	$88,222	0	$ 8,245.00	$0
Sub-total				$88,222			$0
Mark-up at 10.00%				$8,822			$0
TOTAL				**$97,044**			**$0**

Value Analysis Design Alternative

PBS&J

PROJECT:	**Georgia Department of Transportation –EDS-441(44)** **US441/SR 24 –Morgan County– P.I. No 222570**	ALTERNATIVE NO.:	**RD-32**
DESCRIPTION:	**REDUCE MEDIAN WIDTH TO 32' TO REDUCE RIGHT-OF-WAY**	SHEET NO.:	1 of 4

Original Design:

The original design calls for a 44 ft grassed depressed median for rural sections of this project.

Alternative:

Table 6.3 GDOT Design Standards for Arterial Roadways of the GDOT Design Policy Manual allows a 32 to 44 ft depressed median for a 4-lane divided rural arterial with a 70 mph design speed.

Opportunities:

- ROW cost savings
- Earthwork cost savings

Risks:

- Moderate design impacts

Technical Discussion:

Reduction of median width from 44 ft to 32 ft would result in cost savings for ROW acquisition as well as savings on earthwork costs.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 441,259	$	$ 441,259
ALTERNATIVE	$ 0	$	$ 0
SAVINGS	$ 441,259	$	$ 441,259

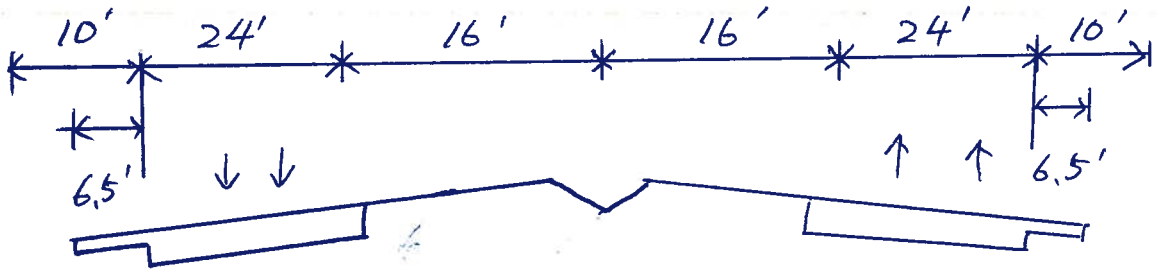
PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County – P.I. No 222570

ALTERNATIVE NO.: **RD-32**

DESCRIPTION: **REDUCE MEDIAN WIDTH TO 32' TO REDUCE ROW**

SHEET NO.: 2 of 4

Typical Section



Calculations

PBSJ

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County– P.I. No 222570

ALTERNATIVE NO.: **RD-32**

DESCRIPTION: **REDUCE MEDIAN WIDTH TO 32' TO REDUCE ROW**

SHEET NO.: 3 of 4

ROW Reduction

Station		Length
From	To	
99+27	485+00	38,573 ft

Median width reduced from 44 ft to 32 ft

A 12 ft reduction

Total ROW reduction = $12 \times 38573 = 462,876\ ft^2$

$= 10.63$ AC.

Earthwork Reduction

Average roadway width 210 ft

12 ft reduction equals to 5.7% reduction

Total project cut is 300,000 CY

Cut reduction is $300,000\ CY \times 5.7\% = 17,100\ CY$

Total project fill is 400,000 CY

Fill reduction is $400,000\ CY \times 5.7\% = 22,800\ CY$

COST WORKSHEET

PROJECT: **Georgia Department of Transportation-EDS-441(44)** ALTERNATIVE NO.: **RD-32**

US441/SR24 -Morgan County- P.I. No.: 222570

DESCRIPTION: ***Reduce median width to 32' to reduce Right-Of-Way*** SHEET NO.: 4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
ROW Reduction	Acres	10.63	$ 8,245.00	$87,644	0	$ 8,245.00	$0
Cut Reduction	CY	17100	$ 5.00	$85,500	0	$ 5.00	$0
Fill Reduction	CY	22800	$ 10.00	$228,000	0	$ 10.00	$0
* The original estimate number of units represents deleting 16' from the ROW and earthwork.							
				$401,144			$0
Mark-up at	10.00%			$40,114			$0
	TOTAL			**$441,259**			**$0**

Value Analysis Design Suggestion

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 – Morgan County – P.I. No 222570

ALTERNATIVE NO.: **RD-35**

DESCRIPTION: **UTILIZE RIGHT-OF-WAY FOR SEDIMENTATION BASINS**

Original Design:

The original design calls for the construction of Sedimentation Basins in additional right of way areas.

Alternative:

The alternative suggestion is to construct the basins within the proposed right of way area.

Opportunities:

- Reduce the required right of way.
- Reduce the initial construction cost.
- Provide for sedimentation removal after initial construction.

Risks:

- May require additional engineering costs.

Technical Discussion:

It appears reasonable that the proposed sedimentation basins may be constructed within the proposed right of way.

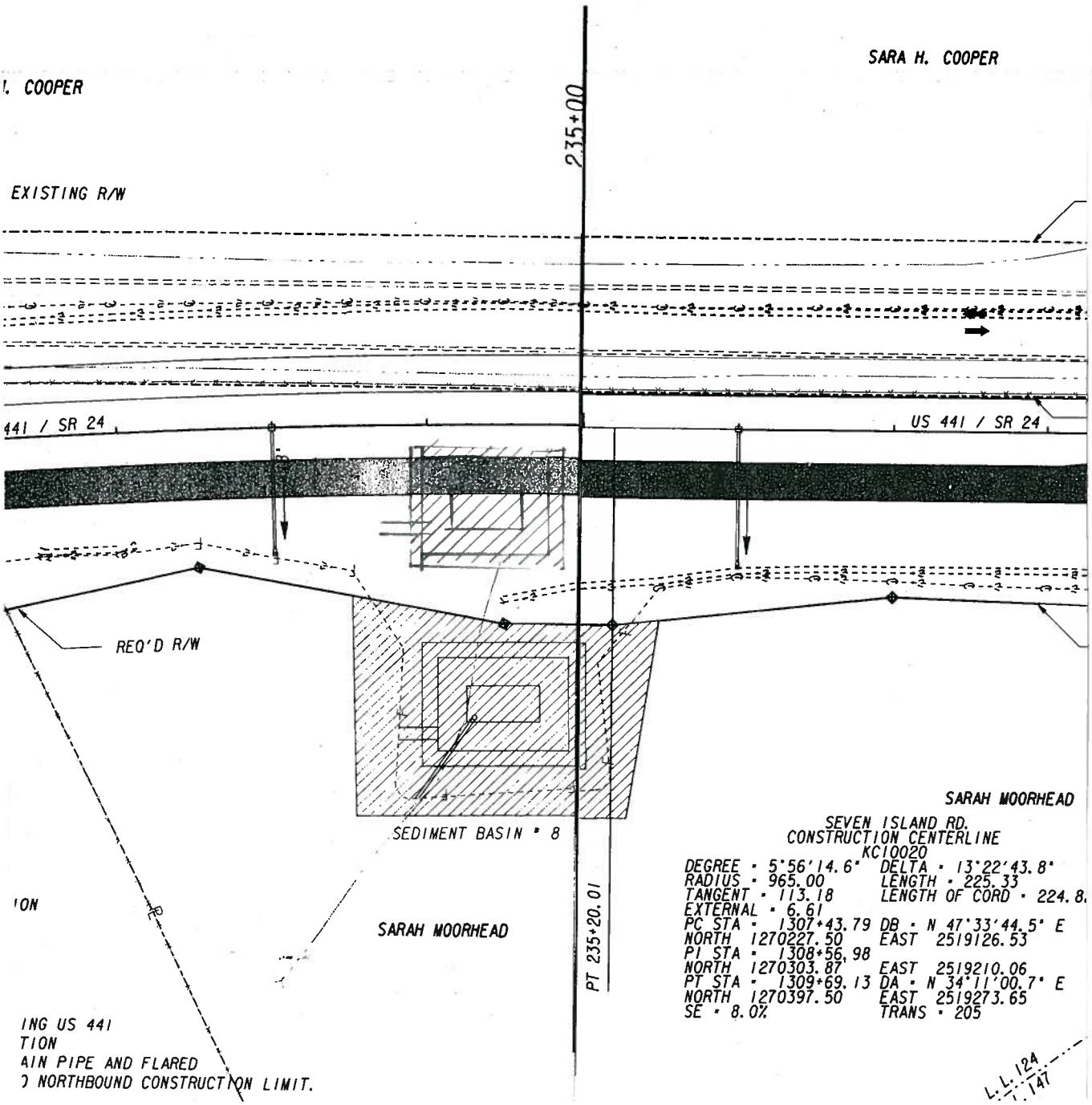
Illustration

PROJECT: **Georgia Department of Transportation –EDS-441(45)**
US441/SR 24 – Morgan County – P.I. No 222570

ALTERNATIVE NO.: **RD-35**

DESCRIPTION: **UTILIZE RIGHT-OF-WAY FOR SEDIMENT BASINS**

SHEET NO.: 2 of 2



Value Analysis Design Suggestion

PBSJ

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 – Morgan County – P.I. No 222570

ALTERNATIVE NO.: **RD-36**

DESCRIPTION: **UTILIZE RIGHT-OF-WAY TO CONSOLIDATE DRIVEWAYS**

SHEET NO.: 1 of 2

Original Design:

The original design allows all properties abutting US 441/SR 24 to have a direct access to the highway, which results in a series of dense driveways on some sections of the highway. For examples, there are four (4) driveways placed on the west side of the highway from station 255+15 to 261+24, and there are two additional properties within this section that currently do not have a driveway yet.

Alternative:

Some of the dense driveways could be consolidated utilizing the space from the right-of-way line to the top point of the back slope. An example illustrating the driveway consolidation for the section from station 255+15 to 261+24 is shown on the Illustration sheet on the next page. In this example, the 4 existing driveways are connected to an access road placed in front of the right-of-way line with one common driveway connecting to US 441/SR 24 at station 261+24. Any new driveways for the properties within this section could be connected to this access road without a direct connection to US 441/SR 24.

Opportunities:

- Enhance safety

Risks:

- May slightly increase construction costs

Technical Discussion:

Access management is an important strategy to enhance the safety of traffic operations on highways, especially high speed highways. The general premise is fewer driveways better safety.

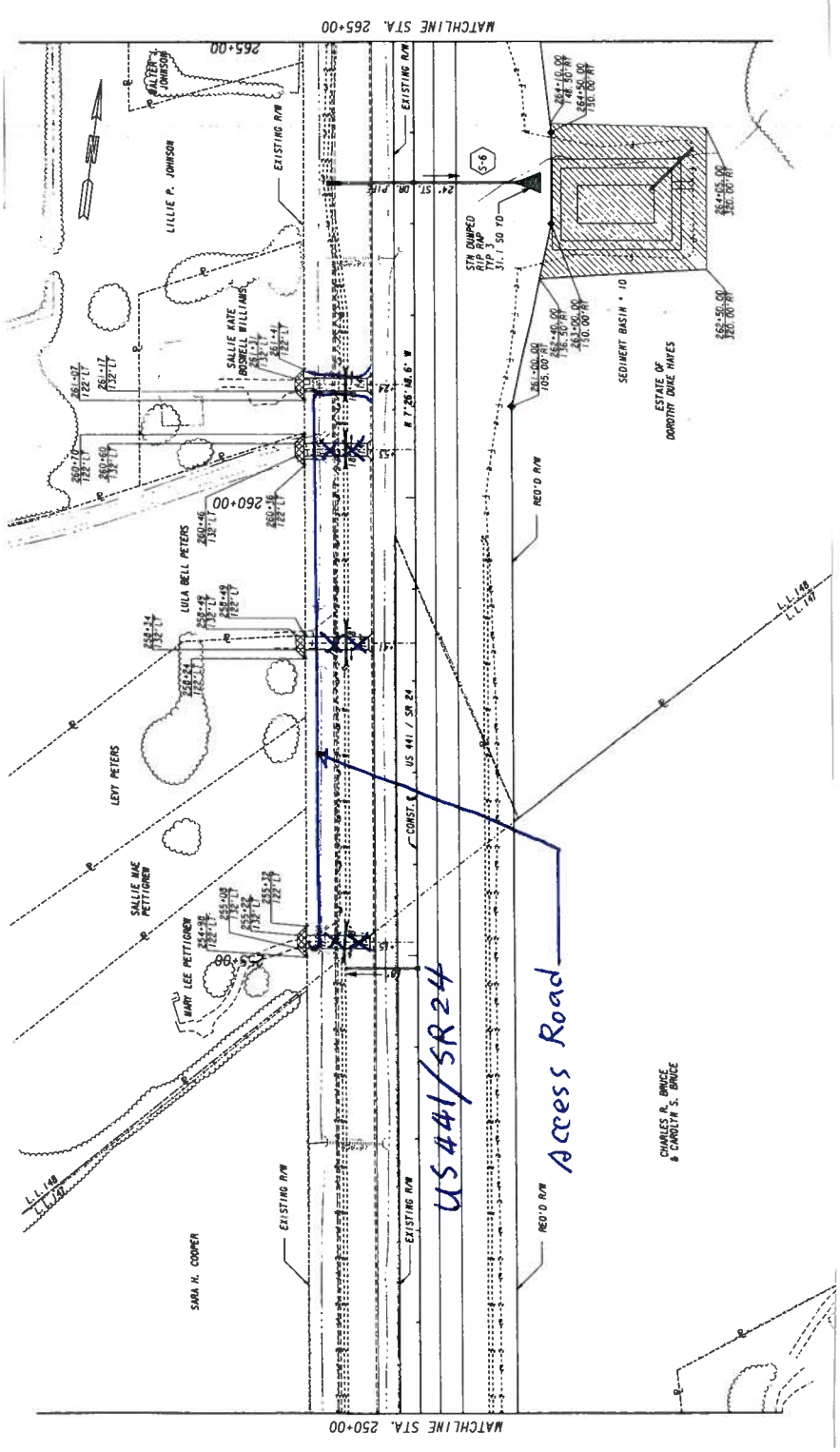
Illustrations

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Putnam County– P.I. No 222580

ALTERNATIVE NO.: **RD-36**

DESCRIPTION: **UTILIZE RIGHT-OF-WAY TO CONSOLIDATE DRIVEWAYS**

SHEET NO.: **2** of 2



Value Analysis Design Alternative

PBSJ

PROJECT: **Georgia Department of Transportation –EDS-441-(44)**
US441/SR 24 –Morgan – P.I. No 222570

ALTERNATIVE NO.: **RD-37**

DESCRIPTION: **USE RAP FROM EXISTING ROADWAY**

SHEET NO.: 1 of 4

Original Design:

The original design made no provisions for the possible use of recycled asphalt pavement or GAB obtained from removal or abandonment of sections of the existing roadway.

Alternative:

The alternative would be to mill this material and to reuse as part of the new pavement.

Opportunities:

- May serve to reduce pavement costs
- Reduces the amount of material to be hauled

Risks:

- Will require additional contractor.

Technical Discussion:

An alternate use for the existing roadway is not addressed in the plans or the estimate. With the large quantity of GAB and ACP required for the construction of the project, use of recycled pavement should result in significant cost savings.

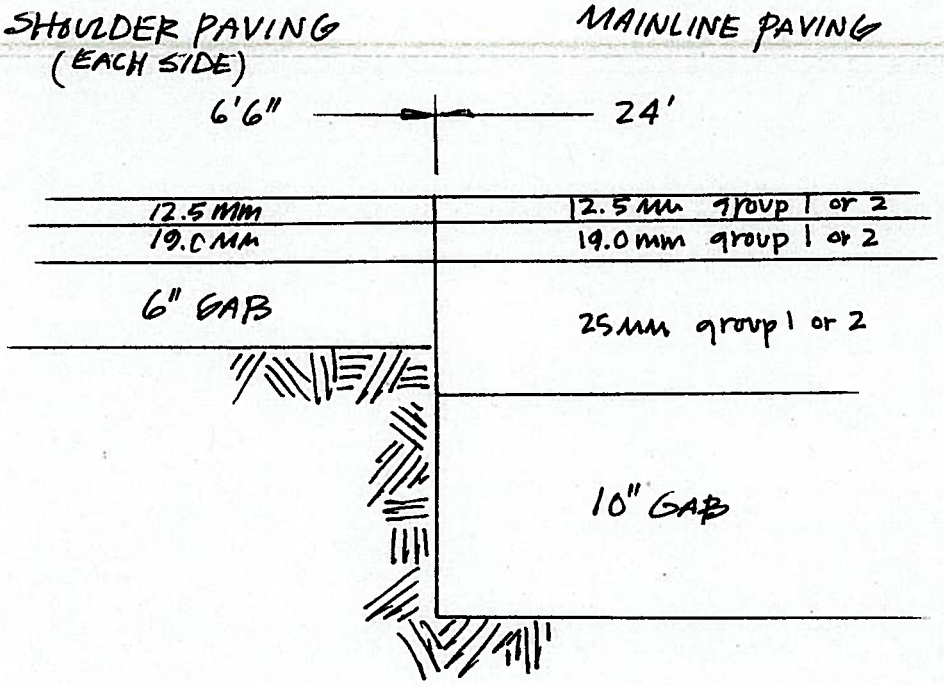
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 5,825,952	$ 0	$ 5,825,952
ALTERNATIVE	$ 4,774,930	$ 0	$ 4,774,930
SAVINGS	$ 1,051,022	$ 0	$ 1,051,022

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County – P.I. No 222570

ALTERNATIVE NO.: **RD-37**

DESCRIPTION: **USE RAP FROM EXISTING ROADWAY**

SHEET NO.: 2 of 4



EXISTING ROADWAY BEGINS STA 99+27.15
ENDS STA 525+30.30

42,602.85 LF

Calculations

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County– P.I. No 222570

ALTERNATIVE NO.: **RD-37**

DESCRIPTION: **USE RAP FROM EXISTING ROADWAY**

SHEET NO.: 3 of 4

EXISTING ROADWAY BEGINS STA. 99+27.15
ENDS STA 525+30.30 — 42,602.85 LF

Using 42,603 LF @ 24' width = 1,046,472 SF OR 116,274 SY

MAINLINE

12.5 mm – 116,274 SY @ 165#/SY = 19,185,210# = 9,593 TN
19.0 mm – 116,274 SY @ 220#/SY = 25,580,280# = 12,790 TN
25.0 mm – 116,274 SY @ 550#/SY = 63,950,700# = 31,975 TN

54,358 TN

		ORIGINAL	ALTERNATE	
9,593 TN	12.5 mm	@ 80.00/TN = 767,440	@ 69.44/TN = 666,138	(101,302)
12,790 TN	19.0 mm	@ 80.00/TN = 1,023,200	@ 65.49/TN = 837,617	(185,583)
31,975 TN	25.0 mm	@ 80.00/TN = 2,558,000	@ 63.47/TN = 2,029,453	(528,547)
				(815,432)

SHOULDER

42,603 LF both sides = 85,206 LF of 6'6" shoulder
= 553,839 SF OR 61,538 SY

12.5mm – 61,538 SY @ 165#/SY = 10,153,770# = 5,077 TN
19.0 mm – 61,538 SY @ 220#/SY = 13,538,360# = 6,769 TN

11,846 TN

5,077 TN	12.5 mm	@ 80.00/TN = 406,160.	@ 69.44/TN = 325,547.	(80,613)
6,769 TN	19.0 mm	@ 80.00/TN = 541,520.	@ 65.49/TN = 443,302.	(98,218)
				(178,831)

TOTAL MAINLINE + SHOULDER
815,432 + 178,831 = **994,263**

COST WORKSHEET

PROJECT:	Georgia Department of Transportation-EDS-441(45)	ALTERNATIVE NO.:	RD-37
	US441/SR24 -Putnam County: P.I. No.: 222580		
DESCRIPTION:	***Use RAP from existing roadway***	SHEET NO.:	4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
				$0			$0
MAINLINE				$0			$0
12.5 mm recycled asph conc	TN	9,593	$ 80.00	$767,440	9,593	$ 69.44	$666,138
19.0 mm recycled asph conc	TN	12,790	$ 80.00	$1,023,200	12,970	$ 65.49	$849,405
25.0 mm recycled asph conc	TN	31,975	$ 80.00	$2,558,000	31,975	$ 63.47	$2,029,453
				$0			$0
SHOULDER				$0			$0
12.5 mm recycled asph conc	TN	5,077	$ 80.00	$406,160	5,077	$ 69.44	$352,547
19.0 mm recycled asph conc	TN	6,769	$ 80.00	$541,520	6,769	$ 65.49	$443,302
	Sub-total			$5,296,320			$4,340,845
Mark-up at	**10.00%**			$529,632			$434,085
	TOTAL			**$5,825,952**			**$4,774,930**

Value Analysis Design Alternative

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441-(44)**
US441/SR 24 –Morgan County– P.I. No 222570

ALTERNATIVE NO.: **RD-38**

DESCRIPTION: **RETAIN EXISTING PAVEMENT**

SHEET NO.: 1 of 5

Original Design:

The original design made no provisions for the possible use of sections of the existing roadway to be incorporated into the new mainline paving.

Alternative:

The alternative would be to possibly utilize sections of the existing mainline where alignment and profile permit.

Opportunities:

- May serve to reduce pavement costs
- Reduces the amount of material to be hauled

Risks:

- May require additional investigations

Technical Discussion:

An alternate use for the existing roadway is not addressed in the plans or the estimate. Where the existing alignment runs concurrent with the new alignment such as from STA 333+00 to STA 363+00 and from STA 197+00 to STA 217+00, the existing roadway could remain which should result in significant savings.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 797,714	$	$ 797,714
ALTERNATIVE	$ 0	$	$ 0
SAVINGS	$ 797,714	$	$ 797,714

Illustrations

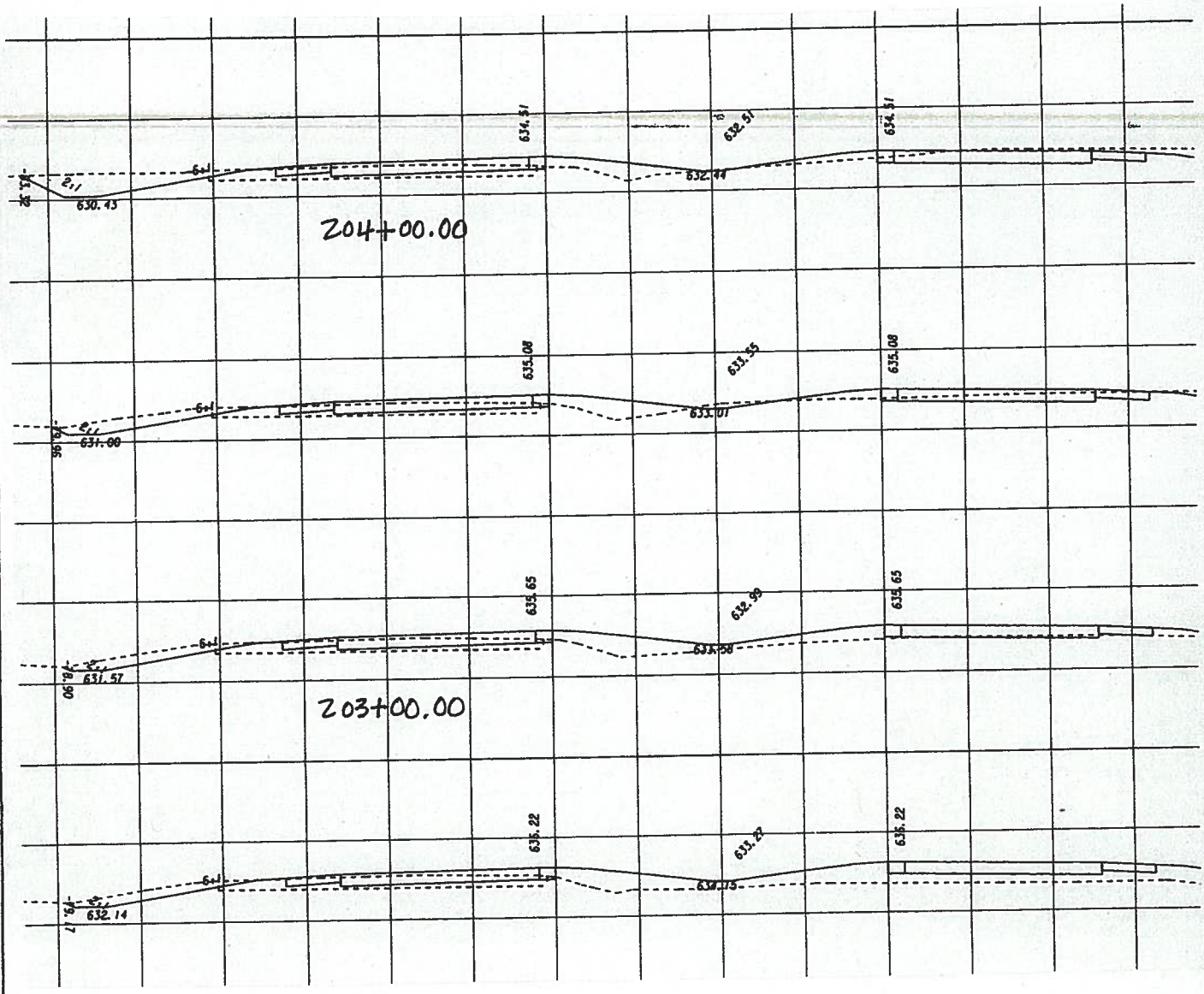
PBSJ

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County – P.I. No 222570

ALTERNATIVE NO.: **RD-38**

DESCRIPTION: **RETAIN EXISTING PAVEMENT**

SHEET NO.: 2 of 5



WHERE THE EXISTING ALIGNMENT RUNS CONCURRENT WITH THE NEW ALIGNMENT SUCH AS FROM STA 197+00 TO STA 217+00 AND THE PROFILE WILL PERMIT, THE EXISTING ROADWAY COULD REMAIN WHICH SHOULD RESULT IN SIGNIFICANT SAVINGS.

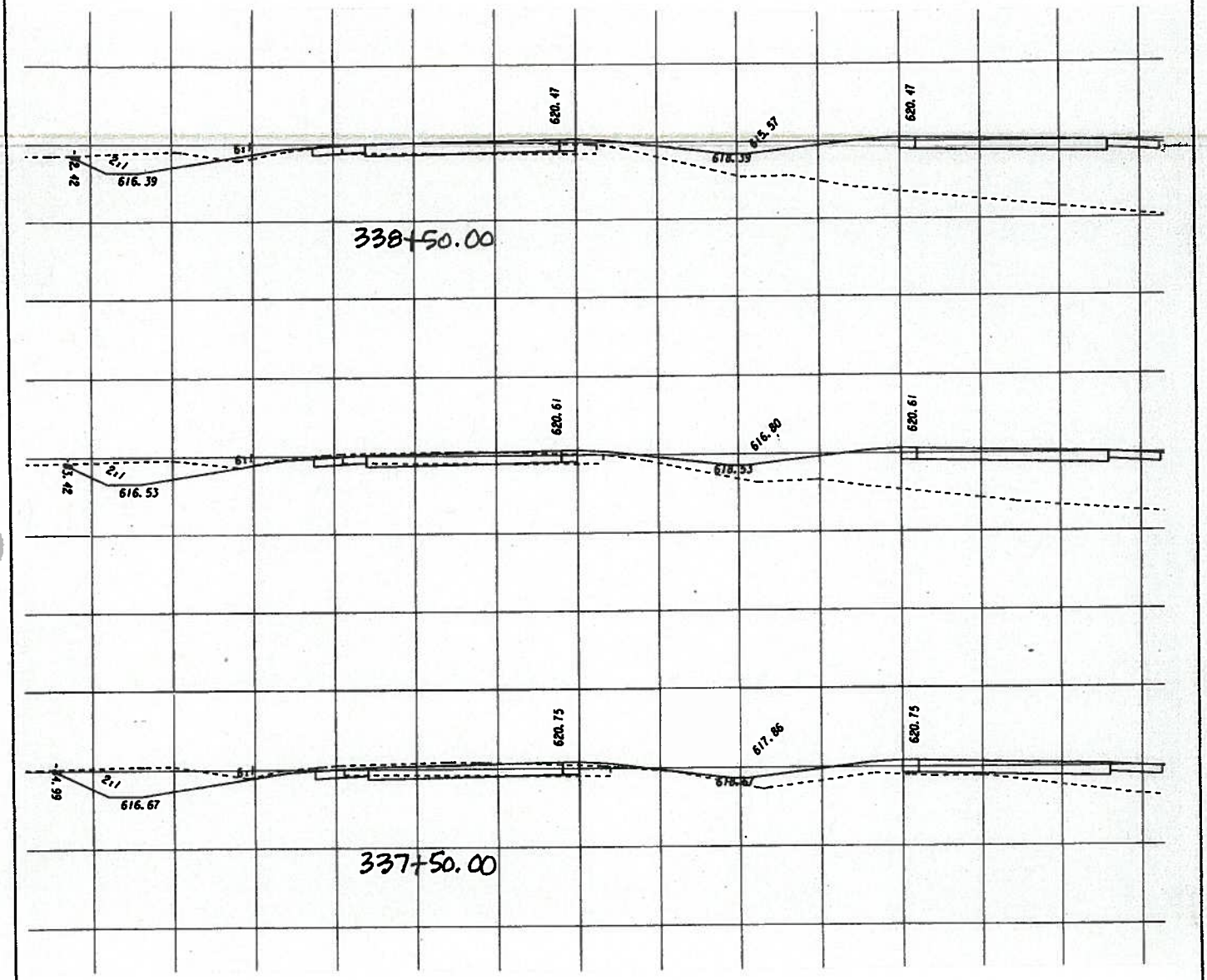
Illustrations

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County – P.I. No 222570

ALTERNATIVE NO.: **RD-38**

DESCRIPTION: **RETAIN EXISTING PAVEMENT**

SHEET NO.: 3 of 5



WHERE THE EXISTING ALIGNMENT RUNS CONCURRENT WITH THE NEW ALIGNMENT SUCH AS FROM STA 333+00 TO STA 363+00 AND THE PROFILE WILL PERMIT, THE EXISTING ROADWAY COULD REMAIN WHICH SHOULD RESULT IN SIGNIFICANT SAVINGS.

Calculations

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County– P.I. No 222570

ALTERNATIVE NO.: **RD-38**

DESCRIPTION: **RETAIN EXISTING PAVEMENT**

SHEET NO.: 4 of 5

MAINLINE PAVING

FROM STA 197+00 to STA 217+00 OR 2,000 LF @ 24' WIDTH
= 48,000 SF = 5,333 SY

FROM STA 333+00 to STA 363+00 OR 3,000 LF @ 24' WIDTH
= 72,000 SF = 8,000 SY

OR 13,333 SY

ASPH CONC

12.5 MM	13,333 SY @ 165#/SY	= 2,199,145#	= 1,100 TN
19.0 MM	13,333 SY @ 220#/SY	= 2,933,260#	= 1,467 TN
25.0 MM	13,333 SY @ 550#/SY	= 7,333,150#	= 3,667 TN
			6,234 TN

10" GAB 13,333 SY

			#	
1,100 TN	12.5 MM	@	69.44/TN	= 76,384.
1,467 TN	19.0 MM	@	65.49/TN	= 96,073.
3,667 TN	25 MM	@	63.47/TN	= 232,681.
13,333 SY	10" GAB	@	24.00/SY	= 319,992.
				725,130

COST WORKSHEET

PBSJ

PROJECT: **Georgia Department of Transportation-EDS-441(45)** ALTERNATIVE NO.: **RD-38**

US441/SR24 -Putnam County: P.I. No.: 222580

DESCRIPTION: ***Retain existing pavement*** SHEET NO.: 5 of 5

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
MAINLINE PAVING							
12.5 mm asph conc	TN	1,100	$ 69.44	$76,384	0	$ 69.44	$0
19.0 mm asph conc	TN	1,467	$ 65.49	$96,074	0	$ 65.49	$0
25.0 mm asph conc	TN	3,667	$ 63.47	$232,744	0	$ 63.47	$0
10" GAB	SY	13,333	$ 24.00	$319,992	0	$ 24.00	$0
	Sub-total			$725,194			$0
Mark-up at	10.00%			$72,519			$0
	TOTAL			**$797,714**			**$0**

Value Analysis Design Suggestion

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 – Morgan County – P.I. No 222570

ALTERNATIVE NO.: **RD-40**

DESCRIPTION: **EXTEND FIVE LANES WITH SHOULDERS TO STA 476+/-**

SHEET NO.: 1 of 3

Original Design:

The original design details the median section beginning at approximately STA 501+00 as you head south.

Alternative:

The alternative would be to possibly continue the five lane section to approximately STA 476+00.

Opportunities:

- May lower ROW needed in this area
- May alleviate removal of trees from orchard at W.A. Lancaster property
- Will provide a transition between a high speed section and a lower-speed curb & gutter section

Risks:

- Will required more base and paving
- Will provide a lower classification of roadway

Technical Discussion:

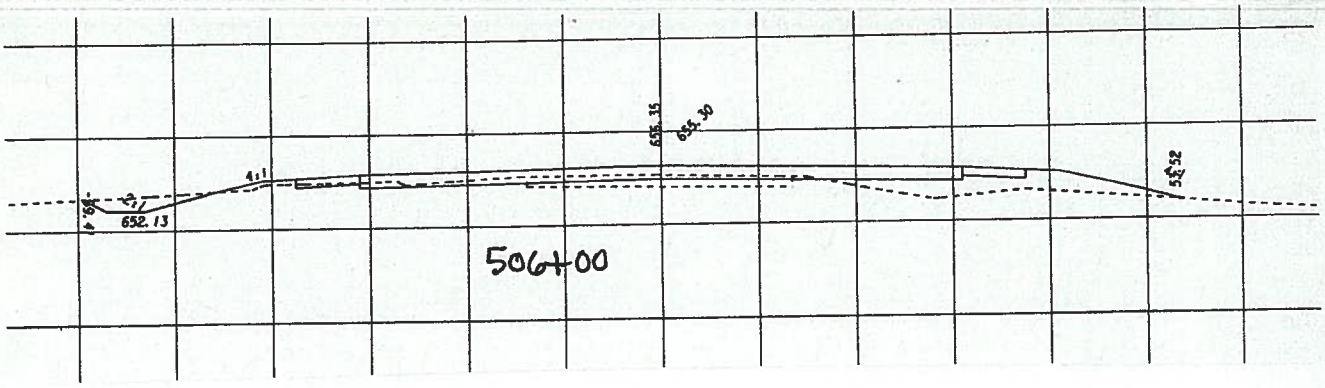
Although this suggestion will require more base and paving, the resultant roadway will lower the amount of ROW to be acquired, possibly eliminate the removal of trees from the adjacent orchard and provide a safer transition from a higher speed section to a lower speed section.

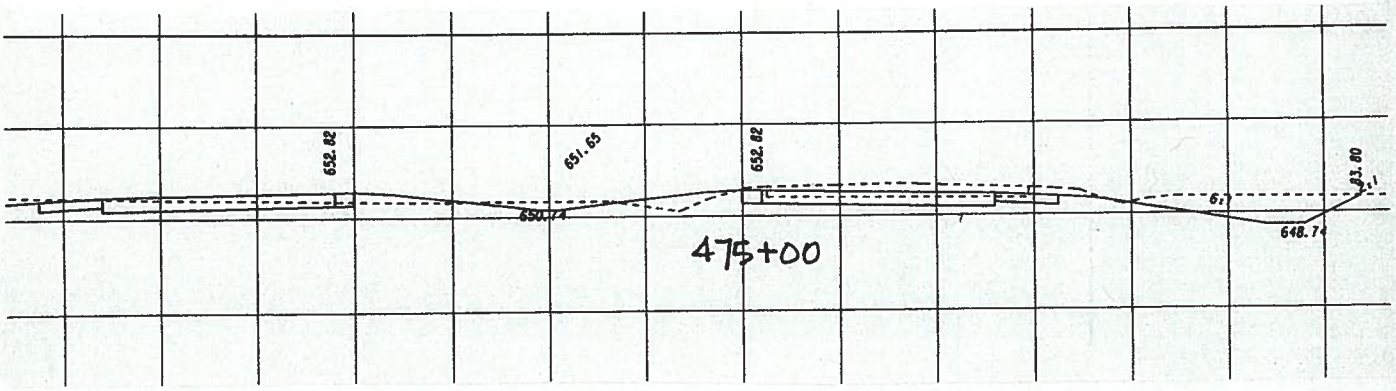
PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County – P.I. No 222570

ALTERNATIVE NO.: **RD-40**

DESCRIPTION: **EXTEND FIVE LANES WITH SHOULDERS TO STA. 476+/-**

SHEET NO.: 2 of 3





Calculations

PBSJ

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County– P.I. No 222570

ALTERNATIVE NO.: **RD-40**

DESCRIPTION: **EXTEND FIVE LANES WITH SHOULDERS TO STA 476+/-**

SHEET NO.: 3 of 3

AS A DESIGN SUGGESTION, WE WOULD OFFER THE POSSIBILITY OF EXTENDING THE FIVE-LANE SECTION FROM THE INTERCHANGE AT INTERSTATE 20 TO STA 476+00. THIS CHANGE WOULD ALLOW A SAFER TRANSITION FROM THE HIGH-SPEED FIVE-LANE SECTION INTO THE MEDIAN DIVIDED SECTION WHICH IS SET TO BEGIN AT APPROXIMATE STA 501+05. THIS CHANGE WOULD ALSO ALLOW REDUCING THE REQUIRED ROW BETWEEN STA 484+00 TO STA 458+00 FROM THE EXISTING 110' LEFT DOWN TO 90' LEFT WHICH COULD PREVENT THE REMOVAL OF BETWEEN 12 AND 14 TREES IN THE W.A. LANCASTER ORCHARD.

THE APPROXIMATE COST FOR THE ADDITIONAL PAVING ASSOCIATED WITH THIS DESIGN SUGGESTION IS $346,000.

ROW SAVINGS WOULD APPROXIMATE ONE ACRE

ASSUMING 14 TREES WOULD BE SAVED FROM REMOVAL AT $25,000/TREE COULD REALIZE SAVINGS OF $350,000.

Value Analysis Design Suggestion

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 – Morgan County – P.I. No 222570

ALTERNATIVE NO.: **RD-42**

DESCRIPTION: **RE-DESIGN SEVEN ISLND ROAD INTERSECTION**

SHEET NO.: 1 of 1

Original Design:

The original design calls for the re-construction of the existing Seven Island Road (CR 251) intersection, which appears to create a non-aligned intersection.

Alternative:

This suggestion would be to review the alignment of the proposed new intersection to create a more perpendicular intersection by either locating the intersection to the south or some other arrangement.

Opportunities:

- Improve operation

Risks:

- None noted.
- May increase initial construction cost.

Technical Discussion:

The current arrangement appears to create a situation whereby Seven Island Rd. westbound traffic cannot make a left turn onto US 441 at the intersection; nor can any traffic in any direction make a left turn even though left turn lanes are identified to be constructed.

Value Analysis Design Alternative

PBSJ

PROJECT:	**Georgia Department of Transportation –EDS-441(44) US441/SR 24 –Morgan County– P.I. No 222570**	ALTERNATIVE NO.:	**EW-31**
DESCRIPTION:	**VERTICALLY BIFURCATE THE ROADWAY TO REDUCE EARTHWORK.**	SHEET NO.:	1 of 4

Original Design:

The original design provides for both roadways to have a common profile grade line.

Alternative:

The alternative design proposes bifurcating the vertical alignment of the roadway and in crease the side slopes of the median to reduce the amount of borrow required to construct the roadway.

Opportunities:

- Reduce the required borrow.
- Increase/maintain median ditch capacity.

Risks:

- Moderate increase in design effort.

Technical Discussion:

A minor bifurcation (~1 foot) in conjunction with steeper side slopes in the median will allow you to lower the roadway on one side in order to reduce the required fill material.

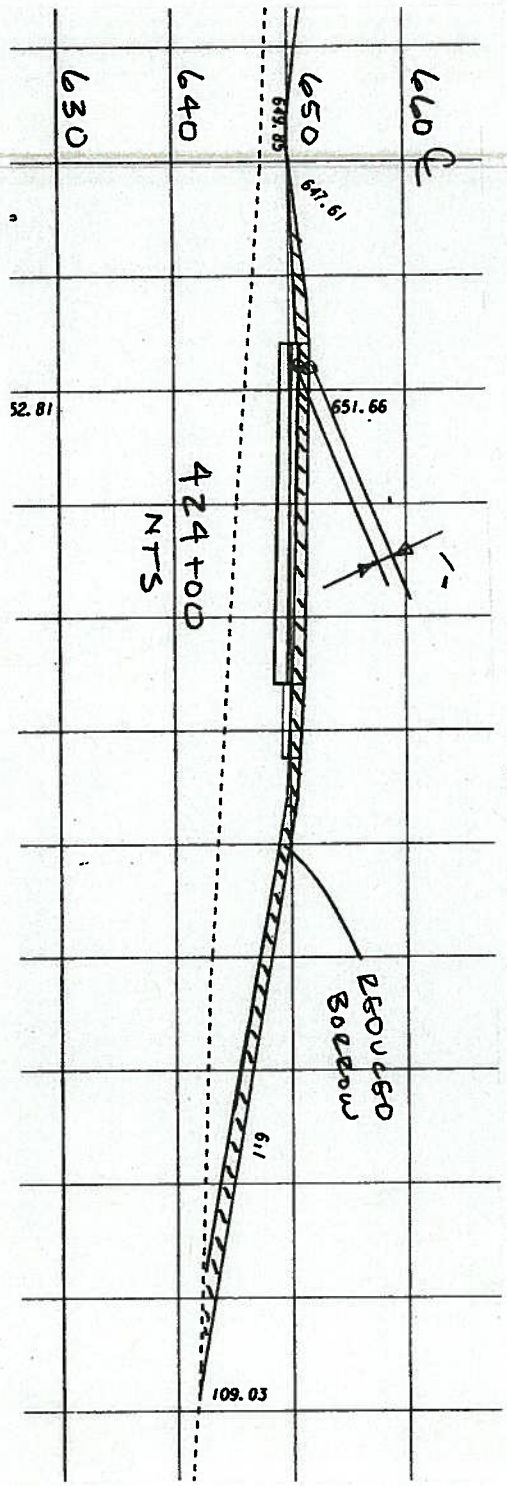
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 4,400,000	$ 0	$ 4,400,000
ALTERNATIVE	$ 3,966,050	$ 0	$ 3,966,050
SAVINGS	$ 433,950	$ 0	$ 433,950

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County– P.I. No 222570

ALTERNATIVE NO.: **EW-31**

DESCRIPTION: **VERTICALLY BIFURCATE THE ROADWAY TO REDUCE EARTHWORK**

SHEET NO.: 2 of 4



Calculations

PBSJ

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County– P.I. No 222570

ALTERNATIVE NO.: **EW-31**

DESCRIPTION: **VERTICALLY BIFURCATE THE ROADWAY TO REDUCE EARTHWORK**

SHEET NO.: 3 of 4

ASSUMPTIONS:

- Bifurcation of 1 foot
- Fill area average of 100' in width
- Fill area on 25% of the job

REDUCED FILL/BORROW:

(1' X 100') (0.25 X 42,600) / (27cf/cy) => 39,450 cy

REQUIRED BORROW:

400,000 cy – 39,450 cy => 360,550 cy

COST WORKSHEET

PBSJ

PROJECT:	Georgia Department of Transportation-EDS-441(44)							ALTERNATIVE NO.: EW-31
US441/SR24 -Morgan County: P.I. No.: 222570								
DESCRIPTION:	VERTICALLY BIFURCATE THE ROADWAY TO REDUCE							SHEET NO.: 4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Borrow	cy	400,000	$ 10.00	$4,000,000	360,550	$ 10.00	$3,605,500
	Sub-total			$4,000,000			$3,605,500
Mark-up at	10.00%			$400,000			$360,550
	TOTAL			**$4,400,000**			**$3,966,050**

Value Analysis Design Alternative

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441(44) US441/SR 24 –Morgan County – P.I. No. 222570**

ALTERNATIVE NO.: **EW-32**

DESCRIPTION: **ADJUST FORE SLOPES TO REDUCE EARTHWORK AND RIGHT OF WAY**

Original Design:

The original design utilizes 6:1 fore slopes on the main roadway typical sections.

Alternative:

Vary the fore slopes on the main roadway from 6:1 up to 4:1. Table 6.3 of the GDOT Design Policy Manual recommends/allows the use of 4:1 fore slopes on 4-lane rural arterials. The Project Concept Report (PI-222580) also recommends/allows the use of 4:1 fore slopes. Consideration should also be given to utilizing an "umbrella section" (increasing the fore slope to 3:1 outside the clear zone).

Opportunities:

- Reduce earthwork / improve earthwork balance
- Reduce required Right of Way
- Deepen ditches / raise the roadway to provide more ditch capacity and reduce the potential of inundating the roadway base

Risks:

- Significant increase in design effort.

Technical Discussion:

The selective use of a combination of 4:1 and 6:1 fore slopes will allow the engineer to minimize the roadway footprint. Use of an umbrella section will allow reduction of the footprint even further.

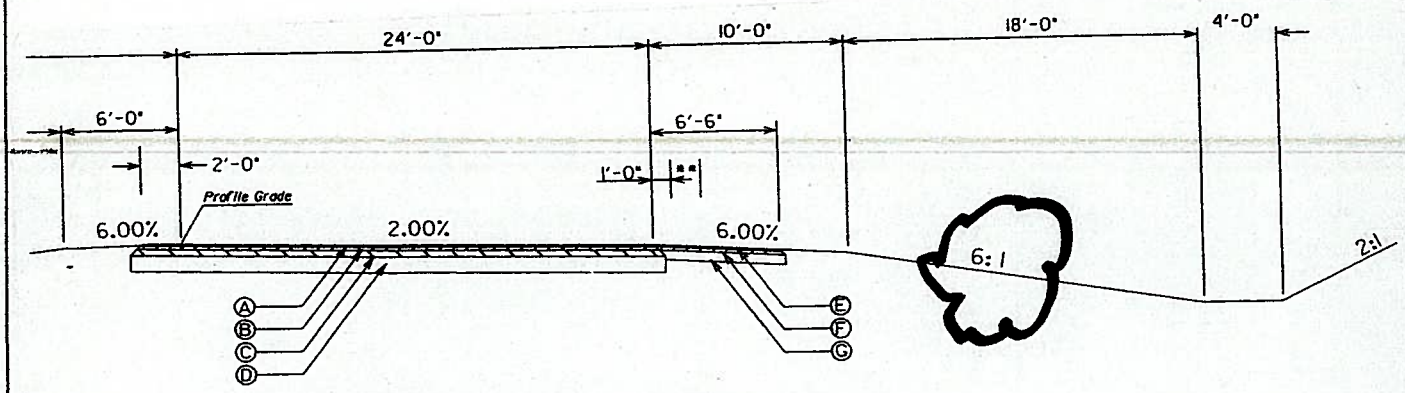
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 4,444,441	$ 0	$ 4,444,441
ALTERNATIVE	$ 4,074,400	$ 0	$ 4,074,400
SAVINGS	$ 370,041	$ 0	$ 370,041

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County– P.I. No 222570

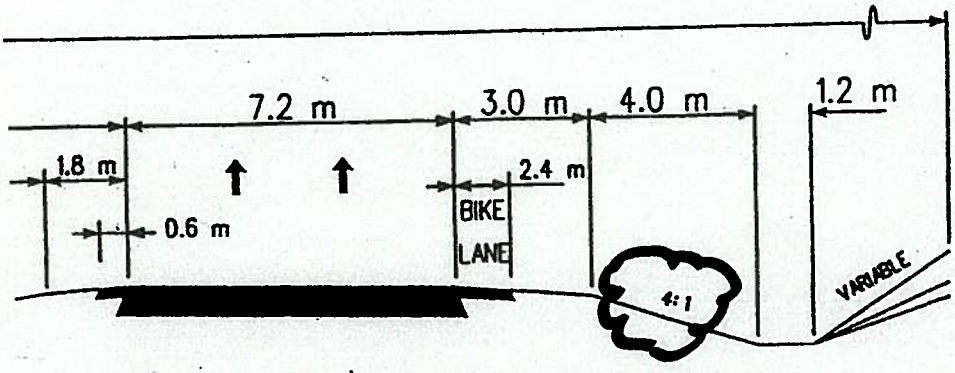
ALTERNATIVE NO.: **EW-32**

DESCRIPTION: **ADJUST FORE SLOPES TO REDUCE EARTHWORK AND RIGHT OF WAY**

SHEET NO.: 2 of 4

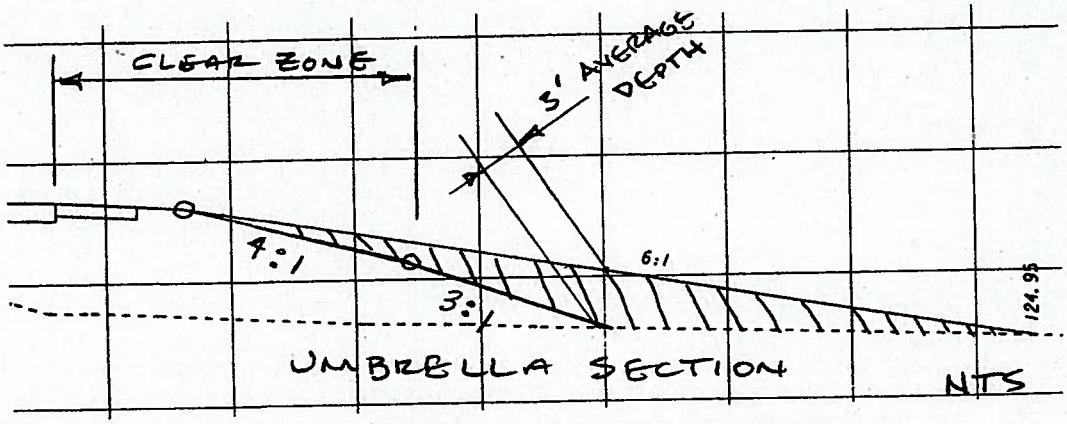


ORIGINAL DESIGN
NTS



ALTERNATIVE DESIGN

FROM CONCEPT REPORT
NTS



UMBRELLA SECTION NTS

Calculations

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County– P.I. No 222570

ALTERNATIVE NO.: **EW-32**

DESCRIPTION: **ADJUST FORE SLOPES TO REDUCE EARTHWORK AND RIGHT OF WAY**

ASSUMPTIONS:

- Average "fill slope" length => 60'
- Average maximum difference in fill depth (4:1 versus 6:1) => 3.0'
- Reduction in "footprint => 20'
- Fill area on 25% of the job

REDUCED FILL/BORROW:

[(2.5' X 60')/2] (0.25 X 42,600') / (27cf/cy) => 29,600 cy

REQUIRED BORROW:

400,000 cy – 29,600 cy => 370,400 cy

RIGHT OF WAY REDUCTION:

(20' X 0.25 X 42,600') / (43,560 sf / acre) => 4.9 acres

COST WORKSHEET

PBSJ

PROJECT:	Georgia Department of Transportation-EDS-441(45)	ALTERNATIVE NO.:	**EW-32**

US441/SR24 -Morgan County: P.I. No.: 222570

DESCRIPTION:	**ADJUST FORE SLOPES TO REDUCE EARTHWORK AND RIGHT OF WAY**	SHEET NO.:	4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS*	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Borrow	cy	400,000	$ 10.00	$4,000,000	370,400	$ 10.00	$3,704,000
Right of Way	acre	4.9	$ 8,245.00	$40,401	0	$ 8,245.00	$0
	Sub-total			$4,040,401			$3,704,000
Mark-up at	10.00%			$404,040			$370,400
	TOTAL			**$4,444,441**			**$4,074,400**

Value Analysis Design Alternative

PBSJ

PROJECT:	**Georgia Department of Transportation –EDS-441(44) US441/SR 24 –Morgan County– P.I. No 222570**	ALTERNATIVE NO.:	**EW-33**
DESCRIPTION:	**ADJUST VERTICAL ALIGNMENT TO REDUCE BORROW**	SHEET NO.:	1 of 4

Original Design:

The original design is as provides for both roadways to have a common profile grade line.

Alternative:

The alternative design proposes lowering the design grade in selected areas where the roadway is in a fill.

Opportunities:

- Reduce the required borrow.

Risks:

- Moderate increase in design effort.

Technical Discussion:

A minor adjustment (~1 foot) lowering the roadway will allow you not only to reduce the required borrow material but will also increase your available fill from increases in excavation. This will alleviate some of the excess borrow condition existing on the project.

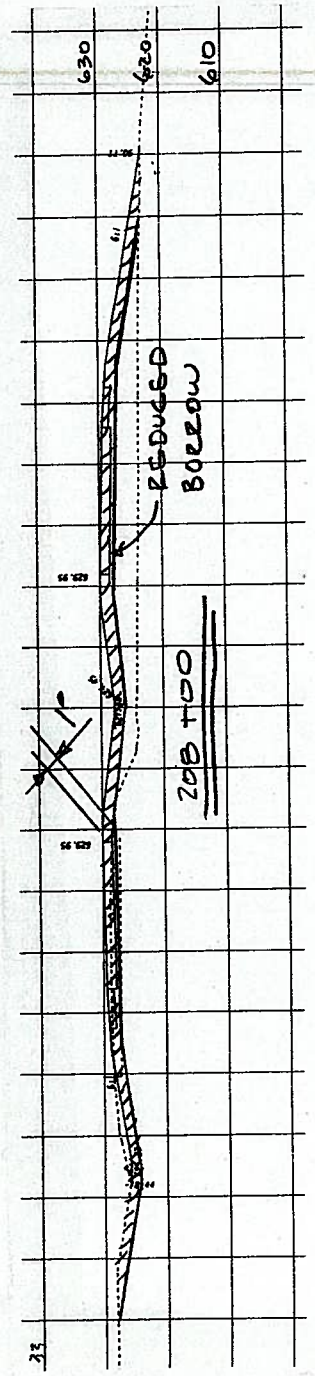
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 4,400,000	$ 0	$ 4,400,000
ALTERNATIVE	$ 4,226,200	$ 0	$ 4,226,200
SAVINGS	$ 173,800	$ 0	$ 173,800

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County– P.I. No 222570

ALTERNATIVE NO.: **EW-33**

DESCRIPTION: **ADJUST VERTICAL ALIGNMENT TO REDUCE BORROW**

SHEET NO.: 2 of 4



PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 –Morgan County– P.I. No 222570

ALTERNATIVE NO.: **EW-33**

DESCRIPTION: **ADJUST VERTICAL ALIGNMENT TO REDUCE BORROW**

ASSUMPTIONS:

- Adjustment of 1 foot
- Fill area average of 120' in width
- Stations in areas of fill:

207+00 to 212+00
228+00 to 235+00
260+00 to 265+00
268+00 to 271+00
294+00 to 300+00
338+00 to 342+00
349+00 to 355+00
373+00 to 378+00
395+00 to 397+00
401+00 to 414+00
435+00 to 439+00
484+00 to 492+00

7100 lf => utilize half the area 3550 lf

REDUCED FILL/BORROW:

(1' X 120'X 3550) / (27cf/cy) => 15,800 cy

REQUIRED BORROW:

400,000 cy – 15,800 cy => 384,200 cy

COST WORKSHEET

PBS&J

PROJECT: **Georgia Department of Transportation-EDS-441(44)** ALTERNATIVE NO.: **EW-33**

US441/SR24 -Morgan County: P.I. No.: 222570

DESCRIPTION: **ADJUST VERTICAL ALIGNMENT TO REDUCE BORROW** SHEET NO.: 4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Borrow	cy	400,000	$ 10.00	$4,000,000	384,200	$ 10.00	$3,842,000
Sub-total				$4,000,000			$3,842,000
Mark-up at 10.00%				$400,000			$384,200
TOTAL				**$4,400,000**			**$4,226,200**

Value Analysis Design Suggestion

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 – Morgan County – P.I. No 222570

ALTERNATIVE NO.: **DR-31**

DESCRIPTION: **ROUTE MEDIAN DRAINS TO DOWNSTREAM SIDE OF THE ROADWAY.**

SHEET NO.: 1 of 1

Original Design:

The original design calls for the construction of storm drains leading from the grassed median to the outside of the pavement area. In some locations these storm drains are routing runoff to a road side swale which routes the runoff to another cross drain which carries the water to the opposite side of the roadway.

Alternative:

Construct the median storm drains such that they route the storm water to the downstream side of the roadway.

Opportunities:

- Reduce initial construction costs

Risks:

- May reduce the project risks

Technical Discussion:

By directly routing the stormwater to the ultimate disposal side of the roadway, the cross drains may be reduced in size to only handle the runoff from the adjacent area.

Value Analysis Design Suggestion

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 – Morgan County – P.I. No 222570

ALTERNATIVE NO.: **DR-32**

DESCRIPTION: **REDUCE/CONSOLIDATE SEDIMENT BASINS**

SHEET NO.: 1 of 1

Original Design:

The original design calls for the construction of temporary sedimentation basins. At some locations there are two or three basins either adjacent or routed to each other.

Alternative:

Combine sedimentation basins (#12 and #13; #5 and #6; #7 an #8; #19, #20, and #21) where reasonable to reduce the temporary easements, construction and demolition.

Opportunities:

- Reduce initial construction costs
- Reduce impact to local users

Risks:

- May reduce the project risks

Technical Discussion:

It may be reasonable to combine adjacent basins and route the stormwater to only one. It may also be possible to construct "mini" basins along the swales in-lieu of actual impoundments, thereby deleting the necessity for easements.

Value Analysis Design Suggestion

PBSJ

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 – Morgan County – P.I. No 222570

ALTERNATIVE NO.: **DR-33**

DESCRIPTION: **MODIFY ROW TO ACCOMMODATE OUTFALL MAINTENANCE**

SHEET NO.: 1 of 1

Original Design:

The original design calls for the construction of storm water outfalls at or near the ROW line.

Alternative:

This suggestion would be to either provide additional ROW or locate the outfall away from the ROW line to allow maintenance crews space to maintain the structures.

Opportunities:

- Reduce O & M costs
- Improve operation

Risks:

- May increase the project costs

Technical Discussion:

To properly maintain the storm water outfalls, the maintenance crews should be provide with adequate space within the ROW to clean and repair the storm drain outfalls.

Value Analysis Design Suggestion

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 – Morgan County – P.I. No 222570

ALTERNATIVE NO.: **DR-34**

DESCRIPTION: **RE-EVALUATE THE ELIMINATION OF OUTFALLS**

SHEET NO.: 1 of 1

Original Design:

The original design calls for the construction of stormwater outfalls at or near the ROW line (Union Chapel Road; Sta. 706+50; Sta. 360+00).

Alternative:

This suggestion would be to either provide additional ROW or locate the outfall away from the ROW line by increasing side slopes to allow maintenance crews space to maintain the structures.

Opportunities:

- Reduce O & M costs
- Improve operation

Risks:

- May increase the project costs

Technical Discussion:

To properly maintain the stormwater outfalls, the maintenance crews should be provide with adequate space within the ROW to clean and repair the storm drain outfalls.

Value Analysis Design Suggestion

PBS&J

PROJECT: **Georgia Department of Transportation –EDS-441(44)**
US441/SR 24 – Morgan County – P.I. No 222570

ALTERNATIVE NO.: **DR-35**

DESCRIPTION: **RE-EVALUATE THE ALIGNMENT OF CROSS DRAINS**

SHEET NO.: 1 of 1

Original Design:

The original design calls for the construction of cross drains to carry the stormwater under the roadway. These drains are sometimes on a very severe diagonal route.

Alternative:

This suggestion would be to review the alignment of the cross drains to determine if they could be routed more perpendicular to the roadway (Sta. 489+00).

Opportunities:

- Reduce initial construction costs
- Improve operation

Risks:

- None noted.

Technical Discussion:

It may be reasonable to align the cross drains more perpendicular to the roadway to reduce the length and depths.

Project Description

PROJECT DESCRIPTION

This project consists of two project which are to address the US 441 widening from its southerly point at the Eatonton Bypass at Sherwood Avenue north to I-20. The projects generally consist of the widening and reconstruction of the existing two and three lane roadway to a four lane rural section with a 44' depressed median and to a four lane rural section with a 14' flush median connecting to the existing similar roadway at the existing I-20 interchange.

The projects address an existing 8.069 mile section in Morgan County (EDS-441(44) (P.I. No. 222570 and a 9.619 mile section in Putnam County (EDS-441(45) (P.I. No. 222580).

The estimated construction cost for the Morgan County (EDS-441(44) (P.I. No. 222570 is $24,850,986 plus the Right of Way acquisition and reimbursable utilities costs.

The estimated construction cost for the Putnam County. (EDS-441(45) (P.I. No. 222580) is $28,095,945 plus the Right of Way acquisition and reimbursable utilities costs.

REPRESENTATIVE DOCUMENTS

- Parsons, Brinckerhoff Quade & Douglas
  - The Concept Report and Plans
  - Construction Cost Estimates

The VE Team utilized the supplied project materials noted above and the current GDOT standard drawings, details and specifications.

Representative documents follow:

Preliminary Cost Estimate

Project Number EDS-441(44) **COUNTY:** Morgan

US 441/SR 24 Improvements (Putnam Co. Line to South of I-20) **DATE:** August 20, 2007

Prepared by Parsons Brinckerhoff **Project Length:** 8.069 Miles

( ) PROGRAMMING PROCESS (X) CONCEPT DEVELOPMENT ( ) DURING PROJECT DEV.

ESTIMATE SUMMARY		
A. Right-of-Way		$0
B. Reimbursable Utilities		$0
C. Construction		
1. Major Structures	$0	
2. Grading and Drainage	$6,437,250	
3. Base and Paving	$13,269,335	
4. Lump Sum Items	$2,370,220	
5. Miscellaneous	$455,000	
6. Special Features	$60,000	
Subtotal Construction Cost		$22,591,805
Engineering and Contingency 10.00%		$2,259,181
Inflation 5.00% / year for 0 years		$0
Total Construction Cost		$24,850,986
Grand Total Cost		$24,850,986

Preliminary Cost Estimate

Project Number EDS-441(44) **COUNTY:** Morgan

US 441/SR 24 Improvements (Putnam Co. Line to South of I-20) **DATE:** August 20, 2007

Prepared by Parsons Brinckerhoff **Project Length:** 8.069 Miles

( ) PROGRAMMING PROCESS (X) CONCEPT DEVELOPMENT ( ) DURING PROJECT DEV.

PROJECT COST						
A RIGHT-OF-WAY						
1 Property (Land and Easement)	0 ac					$0
2 Displacements	RES: 0,	BUS: 0	M.H.:0			$0
3 Damages						
Consequential - ?						$0
Cost to Cure - ?						$0
4 Other Costs (Admin Cost, Inflation)						$0
					Subtotal A	$0
B Reimbursable Utilities						
1 Railroad						$0
2 Transmission Lines						$0
3 Services						$0
					Subtotal B	$0
C Construction Cost						
1 Major Structures						
a. Bridges						
0	sf @	$65	/sf =	$0		
					Subtotal C1	$0
2 Grading and Drainage						
a. Earthwork						
300,000	cy @	$5.00	/cy =	$1,500,000	Unclassified Exc.	
400,000	cy @	$10.00	/cy =	$4,000,000	Borrow	$5,500,000
b. Drainage						
98	ea @	$500	/ ea =	$49,000	18" Fl End Sect	
64	ea @	$500	/ ea =	32,000	24" Fl End Sect	

Preliminary Cost Estimate

Project Number EDS-441(44)

COUNTY: Morgan

US 441/SR 24 Improvements (Putnam Co. Line to South of I-20)

DATE: August 20, 2007

Prepared by Parsons Brinckerhoff

Project Length: 8.069 Miles

( ) PROGRAMMING PROCESS (X) CONCEPT DEVELOPMENT ( ) DURING PROJECT DEV.

7500	lf @	$29	/ lf =	$217,500	18" St Dr Pipe	
3600	lf @	$24	/ lf =	$86,400	18" Side Dr Pipe	
240	ea @	$635	/ ea =	$152,400	18" Safety End Sect	
4800	lf @	$34	/ lf =	$163,200	24" St Dr Pipe	
11	lf @	$2,000	/ ea =	$22,000	Catch Basins	
15	ea @	$1,250	/ ea =	$18,750	Metal Dr Inlets	
98	ea @	$2,000	/ ea =	$196,000	Drop Inlets	$937,250
					Subtotal C2	$6,437,250

Preliminary Cost Estimate

Project Number EDS-441(44) **COUNTY:** Morgan

US 441/SR 24 Improvements (Putnam Co. Line to South of I-20) **DATE:** August 20, 2007

Prepared by Parsons Brinckerhoff **Project Length:** 8.069 Miles

( ) PROGRAMMING PROCESS (X) CONCEPT DEVELOPMENT ( ) DURING PROJECT DEV.

3	Base and Paving						
	a. Asphalt Paving						
	141,632	tons @	$21.00	/ton =	$2,974,272	Aggregate Base	
	47,303	gals @	$1.00	/gal =	$47,303	Bit. Tack Coat	
	19,643	tons @	$80.00	/ton =	$1,571,440	Surface	
	37,048	tons @	$80.00	/ton =	$2,963,840	Binder	
	70,330	tons @	$80.00	/ton =	5,626,400	Base	
	746	tons @	$80.00	/ton =	$59,680	Leveling	$13,242,935
	b. Conc Paving		0 sy @	$40 sy =			$0
	c. Other	2,400 lf @ $11.00 / lf = $26,400			Conc Curb & Gutter		$26,400
						Subtotal C3	$13,269,335
4	Lump Sum Items						
	a. Grassing		180	ac @	$1,200	/ac =	$216,000
	b. Clearing and Grubl		180	ac @	$5,000	/ac =	$900,000
	c. Landscaping						$0

Preliminary Cost Estimate

Project Number EDS-441(44) **COUNTY:** Morgan

US 441/SR 24 Improvements (Putnam Co. Line to South of I-20) **DATE:** August 20, 2007

Prepared by Parsons Brinckerhoff **Project Length:** 8.069 Miles

( ) PROGRAMMING PROCESS (X) CONCEPT DEVELOPMENT ( ) DURING PROJECT DEV.

d. Erosion Control						
36,000	lf @	$3.00	/lf =	$108,000	Type A Silt Fence	
5,000	lf @	$4.00	/lf =	$20,000	Type C Silt Fence	
9,600	lf @	$3.45	/lf =	$33,120	Bale Straw	
10,000	sy @	$4.60	/sy =	$46,000	PSRM	
10,000	sy @	$1.70	/sy =	$17,000	BTGF	
500	sy @	$65.00	/sy =	$32,500	Rip Rap Type 3	
120,000	sy @	$1.20	/sy =	$144,000	Slope Mat	
20	ea @	$7,335.00	/ ea =	$146,700	Sed Basin Ty 3	
130	ea @	$630.00	/ ea =	$81,900	Silt Gate Ty 3	
5,000	sy @	$25.00	/sy =	$125,000	Conc. Ditch Paving	$754,220
e. Traffic Control						$500,000
					Subtotal C4	$2,370,220
5 Miscellaneous						
a. Lighting						$0
b. Signing & Marking						$300,000

PROJECT DESIGN DATABOOK

US 441 WIDENING
MORGAN COUNTY

PROJECT: EDS-441 (44) P.I. NO: 222570

Georgia Department of Transportation

PREPARED FOR:

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
OFFICE OF CONSULTANT DESIGN

Submitted By:

Parsons Brinckerhoff Quade & Douglas

PB 100 YEARS ®

March, 2002

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PARSONS
BRINCKERHOFF

1. **General Roadway Description**

The proposed US 441 Widening project in Morgan County (EDS-441 (44)) will begin at the Morgan/Putnam county line and end just south of I-20. The project will generally consist of widening and reconstructing the existing two and three lane roadway to a four lane rural section with 44' depressed median. The project will shift to the east and west as needed to minimize impacts. It will transition to a 4 lane rural section with 14' flush median just south of I-20.

a. **Design Parameters**

Type of Work:	**Widening and Reconstruction**
Approximate Length of Project	**8.05 miles**
Traffic (ADT)	**Current (2008): 20000** **Projected (2028): 32500**
Design Speed	**65 mph**
PDP Classification	**Major**
Functional Classification	**Rural Principal Arterial**
Minimum Radius	**1485 ft (3°51')**
Maximum Grade	**4.0%**
Maximum Superelevation rate	**8.00%**
Type of Access	**Regulated by Permit**
Number of Lanes	**2 Each Way (typical)**
Lane Widths	**12 feet**
Normal Median Width	**44 feet (depressed)**
Median Crossovers	**Type B**
Typical Right of Way Width	**250 feet**
Bicycle Route	**Yes**

b. **Roadway Configuration**

The Roadway Typical Sections will be as follows:

The final section will consist of a four lane rural section with two 12' lanes in each direction. The median will be 44' depressed with a 2' flat bottom ditch. Inside shoulders will be 6', outside shoulders will be 10'. Shoulder paving will be 6½ ft outside, 2 ft inside. Roadway ditches will consist of 18' front slopes at 6:1, with 2' flat bottom and 2:1 back slope.

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c. **Median Crossovers**

The approved concept report includes median crossovers at the following locations:

Halls Lane
Ponder Pines Rd
Seven Island Rd
Maddox Rd
Crawford Rd
Sunlight Ct
Hilltop Rd
Mission Rd
Pierce Dairy Rd

See construction detail M3

Additional median crossovers may be required to meet maximum spacing requirements and/or to provide additional access.

Normal (minimum) spacing between median openings is 1320 feet in rural areas. Maximum spacing between median openings is 2 miles in rural areas.

d. **Recommended Storage Lengths, Flares & Tapers**

1. **Storage lengths and flares for turn lanes on the mainline and cross streets will be based on the traffic analysis for the turning movement queues.**

2. **Taper Rates (from AASHTO)**
(40 mph or more)
Length = Design Speed x Width
For one lane:
L=12 x DS = 12 x 65 = 780 feet
For ½ lane:
L=6 x DS = 6 x 65 = 390 feet

e. **Clear Zone Requirements**

US 441:

65 mph required clear zone on US 441 will be 32'.

Side Roads:

Requirements for side roads on each project shall be as defined in the AASHTO Roadside Design Guide (Current Edition), based on traffic volumes and design speed.

Utilities will be located in accordance with the Department's utility accommodation policy.

f. Guardrail

Guardrail will be installed in areas where front slopes are steeper than 4:1 and at any obstructions located along the project.

Guardrail will be located in accordance with the Department's "Guidelines for Determining Guardrail Need, Location and Standards".

g. Driveways

Commercial and Residential Driveways generally will be based on GDOT Standards 6050 and 9031 – H.

Driveway widths will be as follows:
Residential: 14'
Commercial: Match in Kind; 35' Max
Driveway grades for commercial and residential driveways shall be determined in accordance with GDOT Standards 6050 and 9031-H
All driveways must be paved to the profile limit.

h. Utilities

Parsons Brinckerhoff will provide affected owners with plan sheets including mapping and proposed centerlines, edges of pavement and construction limits for their use in marking existing utility locations. PB will then use information obtained from the utility owners to show locations of existing utilities on the plans. At preliminary submittal, PB will provide construction plans to the utility companies for their use in providing relocations.

2. DRAINAGE CRITERIA

All proposed drainage structures will be designed to minimize flood hazards within the limits of project areas, and to move the potential flood across the right of way. Drainage design will be accomplished in accordance with the Draft Georgia Department of Transportation Drainage Manual and direction from the Department on specific issues related to this project.

2.1 Design Flood Frequency

The following minimum design frequency will be applied to drainage systems for the project areas:

Description	Minimum Design Frequency
1. Major Cross Channel	50 year
2. Cross Drain	50 year
3. Side Drain	25 year
4. Storm Drain (longitudinal)	10 year
5. Berm Drain	10 year
6. Side Ditches	10 year
7. Ditch Liners	25 year
8. Temporary Sediment Basin (1815 cu ft / ac)	25 year

All roadway ditches (berm, surface) will be designed for the 10-year flood frequency. Ditch protection will be designed for the 25-year flood frequency.

2.2 Hydraulic and Hydrological Studies for Major Drainage Structures

All major drainage structures will be sized in accordance with the policies and guidelines contained within the Draft Georgia Drainage Manual.

2.2.1 Hydraulic Engineering Field Report – Not Required

3. ENVIRONMENTAL CONCERNS

The Environmental Assessment is being prepared by the Department.

4. PUBLIC HEARING – To Be Scheduled

5. CONSTRUCTION STAGING & MAINTENANCE OF TRAFFIC

Generally, throughout this project, two-way traffic will be maintained on the existing roadway while new lanes are being constructed on one side or the other. The proposed profile will be designed so that necessary crossovers will occur at existing grades.

Maintaining traffic on side and cross streets may be more difficult than on the mainline. The mainline profile will be designed as much as possible to avoid cuts at intersections. If the fill required is minor, then the side street may be built

one side at a time. If the required fill is significant, then one of two types of detours will be required: (1) close the road during construction and provide a detour on alternate local roads, or (2) construct a temporary on-site detour.

6. TRAFFIC CAPACITY ANALYSIS

Preliminary Cost Estimate

Project Number EDS-441 (45) **COUNTY:** Putnam

US 129 / US 441 / SR 24 Improvements **DATE:** August 20, 2007

Prepared by Parsons Brinckerhoff **Project Length:** 9.169 Miles

( ) PROGRAMMING PROCESS (X) CONCEPT DEVELOPMENT ( ) DURING PROJECT DEV.

ESTIMATE SUMMARY		
A. Right-of-Way		$0
B. Reimbursable Utilities		$0
C. Construction		
1. Major Structures	$0	
2. Grading and Drainage	$7,315,350	
3. Base and Paving	$15,292,693	
4. Lump Sum Items	$2,117,025	
5. Miscellaneous	$756,700	
6. Special Features	$60,000	
Subtotal Construction Cost		$25,541,768
Engineering and Contingency 10.00%		$2,554,177
Inflation 5.00% / year for 0 years		$0
Total Construction Cost		$28,095,945
Grand Total Cost		$28,095,945

Preliminary Cost Estimate

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PROJECT COST						
A RIGHT-OF-WAY						
1 Property (Land and Easement)	0 ac					$0
2 Displacements	RES: 0,	BUS: 0	M.H.:0			$0
3 Damages						
Consequential - ?						$0
Cost to Cure - ?						$0
4 Other Costs (Admin Cost, Inflation)						$0
					Subtotal A	$0
B Reimbursable Utilities						
1 Railroad						$0
2 Transmission Lines						$0
3 Services						$0
					Subtotal B	$0
C Construction Cost						
1 Major Structures						
a. Bridges						
0	sf @	$65	/sf =	$0		
					Subtotal C1	$0
2 Grading and Drainage						
a. Earthwork						
350,000	cy @	$5.00	/cy =	$1,750,000	Unclassified Exc.	
450,000	cy @	$10.00	/cy =	$4,500,000	Borrow	$6,250,000
b. Drainage						
122	ea @	$500	/ ea =	$61,000	18" Fl End Sect	
84	ea @	$500	/ ea =	42,000	24" Fl End Sect	

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9150	lf @	$29	/ lf =	$265,350	18" St Dr Pipe	
3600	lf @	$24	/ lf =	$86,400	18" Side Dr Pipe	
240	ea @	$635	/ ea =	$152,400	18" Safety End Sect	
6300	lf @	$34	/ lf =	$214,200	24" St Dr Pipe	
0	lf @	$2,000	/ ea =	$0	Catch Basins	
0	ea @	$1,250	/ ea =	$0	Metal Dr Inlets	
122	ea @	$2,000	/ ea =	$244,000	Drop Inlets	$1,065,350
					Subtotal C2	$7,315,350

Preliminary Cost Estimate

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( ) PROGRAMMING PROCESS (X) CONCEPT DEVELOPMENT ( ) DURING PROJECT DEV.

3	Base and Paving					
	a. Asphalt Paving					
	189,838	tons @	$21.00	/ton =	$3,986,598 Aggregate Base	
	57,775	gals @	$1.00	/gal =	$57,775 Bit. Tack Coat	
	23,376	tons @	$80.00	/ton =	$1,870,080 Surface	
	31,168	tons @	$80.00	/ton =	$2,493,440 Binder	
	85,360	tons @	$80.00	/ton =	6,828,800 Base	
	700	tons @	$80.00	/ton =	$56,000 Leveling	$15,292,693
	b. Conc Paving		0 sy @	$40 sy =		$0
	c. Other		0		Conc Curb & Gutter	$0
					Subtotal C3	$15,292,693
4	Lump Sum Items					
	a. Grassing		200 ac @		$1,200 /ac =	$240,000
	b. Clearing and Grubb		200 ac @		$5,000 /ac =	$1,000,000
	c. Landscaping					$0

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. ( ) PROGRAMMING PROCESS (X) CONCEPT DEVELOPMENT ( ) DURING PROJECT DEV.

d. Erosion Control						
8,500	lf @	$3.00	/lf =	$25,500	Type A Silt Fence	
1,400	lf @	$4.00	/lf =	$5,600	Type C Silt Fence DC	
8,960	lf @	$3.00	/lf =	$26,880	Type A Silt Fence DC	
21,180	lf @	$3.45	/lf =	$73,071	Bale Straw	
0	sy @	$4.60	/sy =	$0	PSRM	
0	sy @	$1.70	/sy =	$0	BTGF	
0	sy @	$65.00	/sy =	$0	Rip Rap Type 3	
103,291	sy @	$1.20	/sy =	$123,949	Slope Mat	
23	ea @	$7,335.00	/ ea =	$168,705	Sed Basin Ty 3	
164	ea @	$630.00	/ ea =	$103,320	Silt Gate Ty 3	
0	sy @	$25.00	/sy =	$0	Conc. Ditch Paving	$527,025
e. Traffic Control						$350,000
					Subtotal C4	$2,117,025
5 Miscellaneous						
a. Lighting						$0
b. Signing & Marking						$300,000

Preliminary Cost Estimate

Project Number EDS-441 (45) **COUNTY:** Putnam

US 129 / US 441 / SR 24 Improvements **DATE:** August 20, 2007

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( ) PROGRAMMING PROCESS (X) CONCEPT DEVELOPMENT ( ) DURING PROJECT DEV.

c. Guardrail and Anchoring Systems						
13,700	lf @	$16.00	/lf =	$219,200	Guardrail	
35	ea @	$2,000	/ea =	$70,000	Type 12 Anchorage	
35	ea @	$500	/ea =	$17,500	Type 1 Anchorage	
2500	lf @	$60	/lf =	$150,000	Conc Med Barrier	$456,700
					Subtotal C5	$756,700
6 Special Features						
Lump Sum				$60,000	Field Eng. Office	
					Subtotal C6	$60,000

.O.T.66

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

INTERDEPARTMENT CORRESPONDENCE

FILE EDS-441 (45), Putnam Co.
P.I. No. 222580

OFFICE Traffic Operations
Atlanta, Georgia
DATE May 9, 1997

FROM Marion G. Waters, III, P.E., State Traffic Operations Engineer

TO Wayne Hutto, Assistant Director of Preconstruction

SUBJECT Project Concept Report Review

We have reviewed the concept report on the above project for the proposed widening of SR 24/ US 441 from the Eatonton Bypass to the Morgan county line. The existing two lane roadway will be widened to a four lane section with a 13.6 m grass median. While we believe this concept will improve safety and operational capacity along this section of roadway, we recommend providing for the minimum clear recovery area in the cut sections for a 105 km/h speed design. With this, we find this report satisfactory for approval.

MGW:CKE

Attachment (signature page)

cc: David Studstill
James Kennerly
Bob Mustin, w/attachment
General Files

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
OFFICE OF ENVIRONMENT/LOCATION

PROJECT CONCEPT REPORT
EDS-441(45)
PUTNAM COUNTY
P.I. NO. 222580

US Route No.: 441 **Date of Report:** March 3, 1997

State Route No.: 24

RECOMMENDATION FOR APPROVAL

3/13/97
Date

State Environmental/Location Engineer

Date

State Road & Airport Design Engineer

Date

State Traffic Operations Engineer

4/1/97
Date

Charles W. Morris, Jr. for
District Engineer/Tennille

Date

Project Review Engineer

Date

State Bridge & Structural Design Engineer

Railroad
Not in attendance.

Office of Utilities
Not in attendance.

Schedule
Both projects scheduled to let to construction in late 1999.

Conclusions
Locals are enthusiastic about the projects and they asked do not let "Bishop situation" hold up projects.

RRE/re

Distribution: Wayne Hutto
Ronald Collins/Attn: Warren Bailey
Herman Griffin/Attn: Terry Rogers
Jim Kennerly
Toni Dunagan
Marion Waters
Bobby Mustin
Dudley Ellis
David Meshberger
Larry Seabrook
Bascombe Hughes
Harvey Keepler
Hugh Tyner/Gainesville District
Charles Norris/Tenille District
Luke Cousins

EAB
Not in attendance.

Road Design
Asked about the 5 lane section at the beginning of EDS-441(40) and how far it would be taken. Discussion between Tenille District and road design revealed five lane section extends further than Location was aware (past the second bridge). It was decided that it would be better to begin the 44' median after the second bridge which has already been widened to 5 lanes.
Asked how many wet lands are on EDS-441(44). Told that on this unit there is no impact with wetlands. Road design asked if all units are on bike route. Answered yes. They also asked about an historic boundary at Rock Eagle 4H camp. Location will look into this. RDC asked to check with historic preservation about the area at Rock Eagle.

AT&T
No conflicts, but heavy presence in Bishop

Traffic Operations
Asked how many bypasses we were connecting to. Answered that we would be connecting to three bypasses. They also asked if we had pulled back far enough to make grades work at intersection near Rock Eagle? Answered yes.

District Offices
No comment.

Federal Resource Agencies
Not in attendance.

Engineering Services
Not in attendance.

Georgia Power
They are heavily impacted on EDS-441(42) & (43). Asked if state would allow placement of relocated facilities on R\W. Road design felt that that would be the case.

Materials and Research
Not in attendance.

Maintenance
Not in attendance.

Planning
Provided need and purpose statement. Explained GRIP and EDS.

Programming
Commented thet the high number of displacements called for a re-estimation of R\W costs. We said that the 250' of R\W we show to the public is "the worse case" and a R\W estimate will be requested as soon as we have a "firm" alignment.

to avoid two historic boundaries and the Southern Railway. Approx. 1000' south of CR177(Sidwell Road.), the project goes back to widen the right side of the existing road and holds this alignment to the end of the project just past the Apalachee River.

Design speed is 65MPH (100kph). The proposed R/W is 250' (80m) for 44 ft. median and 150' for 20' raised median. Access control would be by permit. Approx. 15.72 ac. of possible wetlands would be impacted. Nine houses, 1 commercial structure and 2 barns would be displaced.

Project EDS-441(43) is the proposed improvement to the existing US441/SR24. This project proposes to widen the existing roadway from 2 lanes to 4 with a 44 feet grassed median. The project begins just north of Apalachee River (Morgan/Oconee County line) and extends north for 9.47 miles. At its beginning, the concept would widen the east side of the road. Approx. 2500' north of the beginning of the project the alignment would shift left and hold this alignment to approx. 2000' north of CR116 (Tappan Spur Rd.) where the concept would change to hold the right side of the existing R/W to avoid the RR and historic boundaries at CR267 (Salem Rd.). Approx. 1700' north of CR110 (Old Farmington Rd.) the alignment would shift right to avoid an historic boundary on the left . The alignment would shift left 500' north of the historic boundary. Approximately1300' south of CR127 (Astondale Rd.) the concept would shift 500' left to minimize impacts with the City of Bishop and the Southern Railway. Approx. 1500' north of CR265 (Price Mill Rd.) the alignment would go back to widen the existing road on the left and hold this alignment to the end of the project.(approx. 2000' north off CR107 - Thomas Farm Rd.)

Design speed is 65MPH (100kph). The proposed R/W is 250' (80m) for 44 ft. median. Access control would be by permit. Less than 1 ac. of possible wetlands would be impacted. Ten houses, 2 commercial structures and 4 trailers would be displaced.

After review and description of the concepts, those in attendance were asked for their questions and comments.

COMMENTS:

Local Officials

Chairman of Oconee Co. asked about the schedule for these projects and if there is any priority. Answered that the schedule is late 1999, depending of the funding, and there is no priority.
The Chairman also mentioned an additional commercial site north of Bishop not shown on the photography, expensive to relocate.
The Mayor of Bishop asked to consider another alternative to bypass Bishop on the southeast side, where the railroad is abandoned. She also mentioned that the City of Bishop is historic as of 5\96 and she shown a map.
State Representative Stancil said that strongly supports the mayor and citizens of Bishop and the alternative they have requested. He does not feel the RR is usable. He also wanted the number of displacements for Bishop. Told him they are about twenty on the alignment as proposed. He asked about a through movement to the Madison BP. Told that would be handled by a different project, perhaps. Decision might depend upon traffic flow. We would discuss with management. Programming added that if it was decided that another project for this is needed, it should be put in the concept report.

the existing road on the right side 1500' south of US129(SR44). The project ends at the Eatonton Bypass.

Design speed is 65MPH (100kph), proposed ROW is 250' (80m). Access control would be by permit. Less than 1 ac. of possible wetlands would be impacted. Seven houses, 2 commercial structures and 5 mobile homes would be displaced.

Project EDS-441(45) is the proposed improvement to the existing US441/SR24. This project proposes to widen the existing roadway from 2 lanes to 4 with a 44 feet grassed median. The project begins at Reids Road in Putnam County and extends north 8.87 miles to the county line At its beginning, the project holds the existing pavement left, widening the right side of the road. Approx. 1mile north of CR177 the concept begins to hold the existing R\W left to avoit an historic boundary on the left and 1400' north of Bethel Circle Road (CR148) the proposed alignment changes to the left side of the road to avoid an historic boundary (just north of Harmony Dr. on the right side of the road) and to minimize displacements. Just north of this historic boundary the concept shifts to the east side because of another historic boundary on the left side of the existing road and to avoid a cemetery on the same side. The project ends at the Putnam/Morgan County line, where the next section (44) begins.

Design speed is 65MPH (100kph), the proposed R/W is 250' (80m) for 44 ft. median. Access control would be by permit. Less than 1 acre of possible wetlands would be impacted. Thirty houses, 7mobile homes and 3 commercial structures would be displaced.

Project EDS-441(44) is the proposed improvement to the existing US441/SR24. This project proposes to widen the existing roadway from 2 lanes to 4 with a 44 feet grassed median. A 20 foot raised median would be used in some sections. The project begins at Putnam - Morgan County line and extends north 8.6 miles to Industrial Park Road (CR225). At its beginning, the project holds the existing pavement west , widening the east side to avoid a historic boundary on left. Approximately. 1000' south from CR204(Hilltop Rd.) alignment changes on the left side to minimize displacements and to avoid "Tucker family graves," an old historic monument. Approx. 2200' south of Pierce Dairy Road (CR121) the concept begins transitioning to a 20' raised median and ties into the existing 5 lane section. The project ends at Industrial Park Road (CR225).

Design speed is 65MPH (100kph), the proposed R/W is 250' (80m) for 44 foot median and 150' (46m) for the 20' raised median section. Access control would be by permit. No wetlands are impacted. Six houses, 1 commercial structure and 2 mobile homes would be displaced.

Project EDS-441(42) is the proposed improvements to the existing US441/SR24. This project proposes to widen the existing roadway from 2 lanes to 4 with a 44 feet grassed median. The project begins at the Madison Bypass and extends north approx. 7.72 miles to just north of the Apalachee River (Morgan-Occonee county line). The concept begins with a 20' raised median and approx. 800' north, the project starts transitioning in a 44' grassed median and holds the left existing R\W to avoid four historic boundaries on the left side of the existing road. Just north of the four historic boundaries the concept holds the left existing pavement widening to the right side. The alignment shifts to the left side 2300' south of CR174 (V.F.W. Lane) and shifts back to the right side 1500' north of CR174 to minimize displacements. The concept would hold the right side to a point 1500' south of CR170 (Apalachee Rd.) where it would shift approximately 600' left

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

INTERDEPARTMENTAL CORRESPONDENCE

FILE EDS-441(40,45,44,42,43) Baldwin, Putnam, Morgan, & Oconee County
P.I. Numbers 222470, 222580, 222570, 222560, & 122660

OFFICE Environment/Location

DATE June 24, 1996

FROM Roxana Ene, TE I, Location Engineer

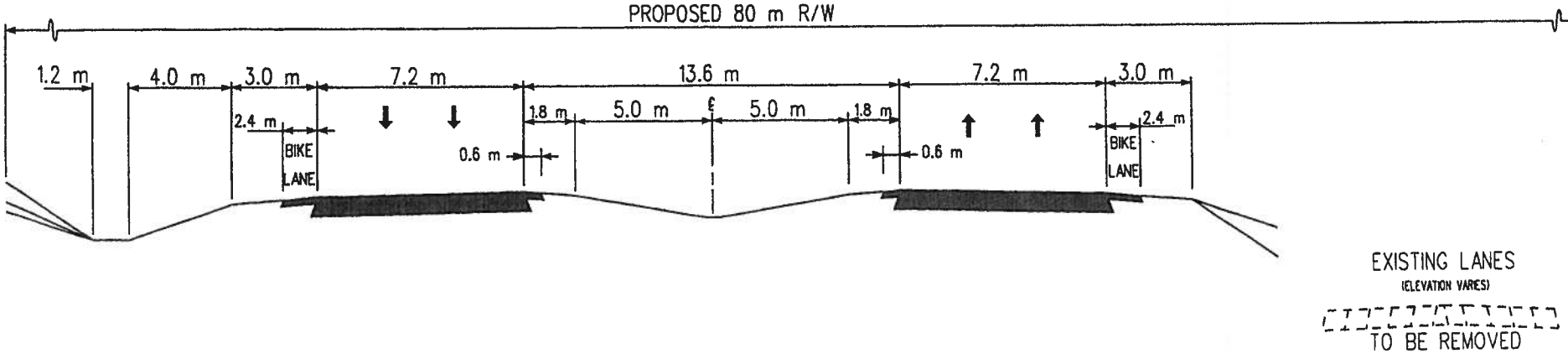
TO Distribution Below

SUBJECT **CONCEPT TEAM MEETING MINUTES** - US441\SR24 Improvements

On Thursday, June 20, 1996, at 1:30 p.m., a Concept Team Meeting for the proposed US441\SR24 improvement projects in Baldwin, Putnam, Morgan, and Oconee Counties was held in the conference room at the Office of Environment\Location. Representing Georgia Power was Charles L. Chapman. Wendell Dawson and Peter Mallory represented Oconee Co. In attendance from the City of Bishop was Mayor Nedra Johnson. State Representative Frank E. Stancil was also in attendance. Mike Reynolds, Kevin Hosey, Robert Reid and Willie L. Webb from the Office of Road Design were present. Pat Astin-Hand represented the Office of Right-of-Way. The Office of Planning was represented by Cindy VanDyke. Reba P. Scott from the Office of Programming was present. Representing Traffic Operations was Ken Estes. Terry Allgood represented the Walton EMC. In attendance from AT&T were Steve Puckett, Gary Jenkins and Damien Wilson. From NEGRDC were Jennifer Fire, Ruth Lessh and Adriane Wood from the MGRDC. District 1 was represented by Laland Owens and District 2 by David Griffith, Phillip Scarborough and Deborah Pennington. Warren Beverly, Gerald Welsh, Roxana Ene, Ken Thompson and Terry Dentmon of the Office of Environment/Location also attended.

The meeting was opened by Gerry Welsh of Location. He gave a brief description of the projects, explaining that the meeting was being held to discuss improvements to US441\SR24. The concepts were then described in detail by Roxana Ene.

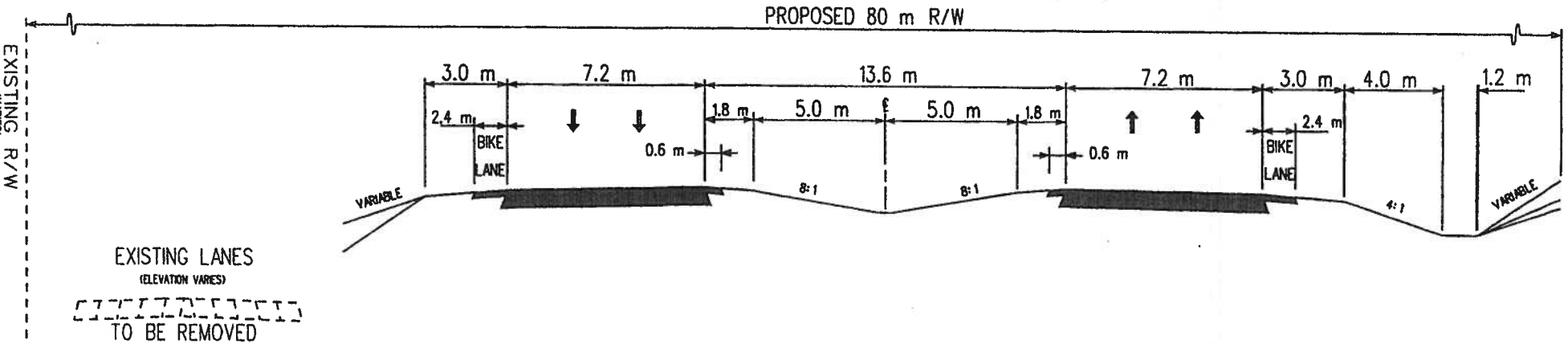
Project EDS-441(40) is the proposed improvement to the existing US441/SR24. This project proposes to widen the existing roadway from 2 lanes to 4 with a 44 feet grassed median. The project begins in Baldwin Co. and extends north 10.4 miles to US129(SR44). At its beginning, the project extends the existing 5 ln.section to just north off the first bridge, where the concept begins transitioning to the 44'median. The concept would hold the existing pavement left, widening the right side of the existing road. Approx. 1 mile north of Cay road (CR245) the proposed alignment changes to the left side of the road to avoid a cemetery on the right side. Approx. 2200' north of Twin Bridges Road (CR72) the proposed alignment changes to the right side to avoid two historic boundaries. The proposed alignment changes to the left side of the road 4000' north of CR246 (Woodland Acres Rd.) to avoid impacting an historic boundary on the right side. Approx. 1200 ft. south of Crest View Rd. (CR247) the proposed alignment shifts left on new location, bridges the RR, avoids an historic boundary on the left side and goes back to widen



L2

TYPICAL CROSS SECTION
IMPROVEMENTS TO U.S. 441
EDS-441(45) PUTNAM COUNTY
HARMONY DR.(CR 117) TO 0.3 km NORTH OF HARMONY DR.(CR 117)

NOT TO SCALE



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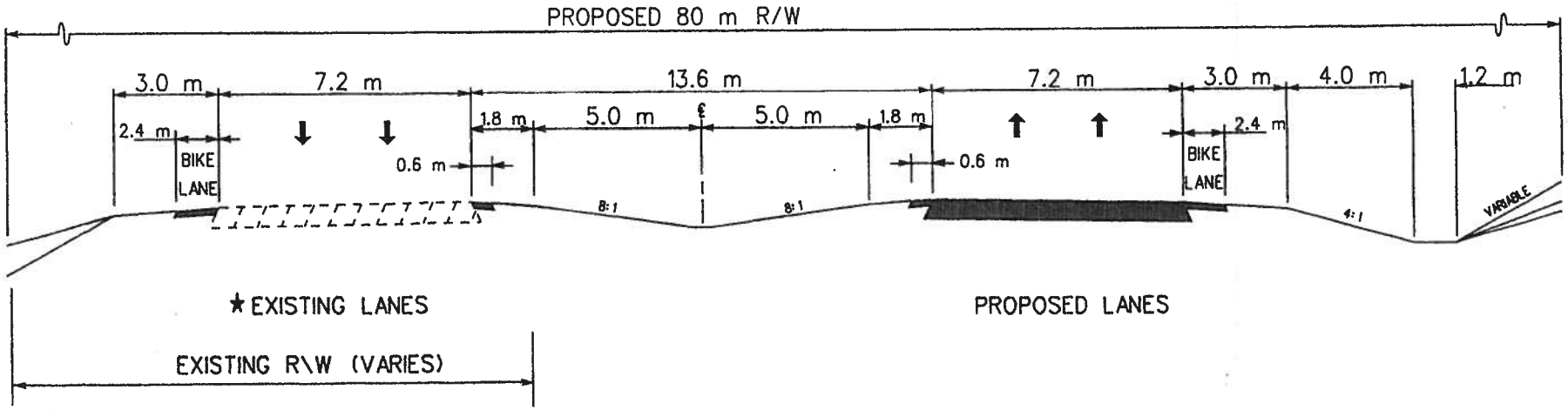
TYPICAL CROSS SECTION
IMPROVEMENTS TO U.S. 441
EDS–441(45) PUTNAM COUNTY

1.6 km NORTH OF C.R. 177 TO 1.6 km SOUTH OF HIPP RD.
0.3 km NORTH OF HARMONY DR.(CR 117) TO 0.3 km NORTH OF GRIFFITH RD.(CR 97)
0.9 km SOUTH OF PIERCE RD. TO 0.33 km SOUTH OF PIERCE RD.

NOT TO SCALE



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TYPICAL CROSS SECTION
IMPROVEMENTS TO U.S. 441
EDS-441(45) PUTNAM COUNTY

BEGIN PROJECT TO 1.6 km NORTH OF CR 177
1.6 km SOUTH OF HIPP RD. TO BETHEL CIRCLE RD.(CR 148)
0.3 km NORTH OF GRIFFITH Rd.(CR 97) TO 0.9 km SOUTH OF PIERCE Rd.
0.33 km SOUTH OF PIERCE RD. TO THE END OF PROJECT

NOT TO SCALE

NOTE: * EXISTING PAVEMENT WILL BE REMOVED IF VERTICAL RECONSTRUCTION REQ'D.

Value Engineering Process

VALUE ENGINEERING PROCESS

Introduction

This report summarizes the analysis and conclusions by the PBS&J Value Engineering team as they performed a VE Study during the period of September 10- 13, 2007 in Atlanta, Georgia, for the Georgia Department of Transportation.

The Value Engineering Study team and its leadership were provided by PBS&J. This VE Team consisted of the following:

Les M. Thomas, P.E., CVS-Life	Certified Value Specialist
Luke Clarke, P.E.	Highway Design Engineer
Dr. John Luh, P.E.,AVS	Highway Design Engineer
Ron Hale, P.E.	Highway Construction Specialist
Randy S. Thomas, AVS	Assistant Team Leader

The Value Engineering Team followed the Seven Step Value Engineering job plan as promulgated by SAVE International. This Seven Step job plan includes the following:

- **Investigation/Information Phase** – during this phase of the VE Team's work, the team received a briefing from the Georgia Department of Transportation (GDOT) design team and staff. This briefing included discussions of the design intent behind the project, the cost concerns, the physical project limitations. In the working session that followed, the VE Team developed cost models from the cost data provided by the designers and familiarized themselves with the construction drawings and other data that was available to the team. Some of the representative project information (concept report, cost estimate, and special provisions) may be found in the tabbed section of this report entitled ***Project Description***. Following this current narrative the reader will also find a cost model done in the Pareto fashion, i.e., identifying the highest costs down to the lowest costs for the larger construction cost elements. This cost model, developed by the VE Team, was used by the VE Team to help focus their week of work. The headings on the Pareto Chart also were used as headings for creative phase activities.

- **Analysis Phase** – during this phase the VE Team determined the "**Functions**" of the project. This was accomplished by reviewing the project from the simplest format in asking the questions of "What is the project suppose to do?", and "How is it suppose to accomplish this purpose? In the Value Engineering vernacular, the answers to these questions are cast in the form of active verbs and measurable nouns. These verb/noun pairs form the basis of the function analysis which distinguishes a Value Engineering effort from a potentially damaging cost cutting exercise.

- The important functions of the project were identified as follows:

    - **Project Objective/Goals**
        - **Improve Level of Service**
        - **Increase Capacity**
        - **Separate Traffic**
        - **Provide for future growth**

    - **Project Basic Functions**
        - **Construct Additional Traffic Lanes**
        - **Construction Additional Turn Lanes**
        - **Provide Separation of Traffic**
        - **Provide "U" Turn Lanes**
        - **Provide Traffic Controls**

- **Speculation Phase -** The VE team performed a brainstorming session to identify ideas that might help meet the project objectives:

    - Improve Level of Service
    - Improve Safety
    - Increase Capacity
    - Reduce construction and life cycle costs
    - Reduce the time of construction

    This brainstorming session initially identified numerous ideas that were then evaluated in the Judgment phase. The reader will find the creative worksheets enclosed. These same work sheets were also used to record the results of the Judgment/Evaluation Phase.

- **Evaluation Phase –** Once the VE Team identified the creative ideas, it was necessary to decide which alternatives should be carried forward. This is the work of the Evaluation or Judgment Phase. The VE Team reflected back on the project constraints and objectives shared with the team by the owner's representatives, in the kick-off meeting on the first day of the workshop. From that guidance, the team selected ideas that they believed would improve the project by a vote process.

- Following that selection process, the VE Team used the following values as measures of whether or not an alternative had enough merit to be carried forward in the VE process:

    - Construction Cost Savings
    - Maintainability
    - Ability to Implement the Idea
    - General Acceptability of the Alternatives
    - Constructability

    Based on these measurement sticks, the VE Team evaluated the alternatives and graded them from 5 (Excellent) down to 1 (Poor). Other notes about the alternatives are annotated at the bottom of the enclosed creative and evaluation sheets.

- **Development Phase** – During this phase, the VE Team developed each of the selected design alternatives. This effort included a detailed explanation of the idea with sketches as appropriate to clarify the idea from the original concept, advantages and disadvantages, a technical explanation and an estimation of the cost and resultant savings if implemented. (see the tabbed section – Study Results)

- **Recommendation Phase** – During this phase the VE Team reviews the alternative ideas to confirm which ones are appropriate for the project, have an opportunity for success and which will improve the value of the project if implemented.

- **Presentation Phase** – As noted earlier, the team made an informal "out-briefing" on the last day of the workshop, designed to inform the Owners and the Designers of the initial findings of the VE Study. This written report is intended to formalize those findings.

The following FAST Diagram and **Function – Worth - Cost** Analysis, were utilized to focus the team and stimulate brainstorming; a copy of the **Attendance Sheets** is also attached so that the reader can be informed about who participated in the Study proceedings.

FUNCTION ANALYSIS AND COST-WORTH

PBS&J

PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**
Proj. No. EDS-441(45) Putnam County PI No: 222580

SHEET NO.: 1 of 4

NO.	ELEMENT	*FUNCTION* VERB	NOUN	KIND	COST (000)	WORTH (000)	COMMENTS
1	**OVERALL PROJECT**	Increase	Traffic Capacity	B	28,095,945	26,000,000	C/W = 1.08
		Separate	Traffic	S			
		Enhance	Safety	S			
2	**RIGHT OF WAY (ROW)**	Accommodate	Widening	B	10,000,000	8,000,000	CW =1.25
		Facilitate	Utilities	RS			
		Accommodate	Amenities	S			
3	**ROADWAY (RD)**	Increase	Capacity	B	15,292,693	14,000,000	C/W = 1.09
		Enhance	Safety	S			
4	**EARTHWORK (EW)**				6,250,000	4,000,000	C/W = 1.56
5	**DRAINAGE (DR)**	Convey	Storm Water		1,065,350	800,000	C/W = 1.33
		Facilitate	Utilities				

Function defined as: **Action Verb**
Measurable Noun

Kind: B = Basic
S = Secondary
RS = Required Secondary
HO = Higher Order
LO = Lower Order

Cost/Worth Ratio =
(Total Cost ÷ Basic Worth)

FUNCTION ANALYSIS AND COST-WORTH

PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**
Proj. No. EDS-441(45) Putnam County PI No: 222580

SHEET NO.: **2 of 4**

NO.	ELEMENT	FUNCTION			COST (000)	WORTH (000)	COMMENTS
		VERB	NOUN	KIND			
6	**CLEARING & GRUBBING**				1,000.000	900,000	C/W =1.11
7	**EROSION CONTROL**				527,025	500,000	C/W =1.05
8	**GUARDRAIL & ANCHORING SYSTEMS**	Enhance	Safety	B	456,700	456,700	C/W = 1.0
9	**TRAFFIC CONTROL**	Facilitate	Safe Construction		350,000	350,000	C/W = 1.0
10	**SIGNING & MARKING**	Enhance	Directions	S	300,000	300,000	CW =1.0
		Channelize	Traffic	S			
11	**GRASSING**				240,000	240,000	CW =1.0
12	**FIELD ENGINEERS OFFICE**				60,000	60,000	CW =1.0

Function defined as: **Action Verb**
Measurable Noun

Kind: B = Basic
S = Secondary
RS = Required Secondary
HO = Higher Order
LO = Lower Order

Cost/Worth Ratio =
(Total Cost + Basic Worth)

FUNCTION ANALYSIS AND COST-WORTH

PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**
Proj. No. EDS-441(44) Morgan County PI No.: 222570

SHEET NO.: **3 of 4**

NO.	ELEMENT	FUNCTION			COST (000)	WORTH (000)	COMMENTS
		VERB	NOUN	KIND			
1	**OVERALL PROJECT**	Increase	Traffic Capacity	B	24,850,986	22,000,000	C/W =1.13
		Enhance	Safety	B			
2	**ROADWAY (RW)**	Increase	Traffic Capacity	B	13,242,935	12,000,000	C/W = 1.1
		Enhance	Safety	S			
3	**RIGHT-OF-WAY**	Accommodate	Widening	B	10,000,000	8,000,000	CW =1.25
		Facilitate	Utilities	S			
4	**EARTHWORK (EW)**			RS	5,500,000	4,500,000	C/W = 1.22
5	**DRAINAGE (DR)**	Convey	Stormwater	S	937,250	937,250	C/W = 1.0
		Protect	Pavement				
8	**CLEARING & GRUB**				900,000	800,000	CW =1.125
7	**EROSION CONTROL**				754,220	600,000	CW =1.25

Function defined as: **Action Verb**
Measurable Noun

Kind: B = Basic
S = Secondary
RS = Required Secondary
HO = Higher Order
LO = Lower Order

Cost/Worth Ratio =
(Total Cost + Basic Worth)

FUNCTION ANALYSIS AND COST-WORTH

PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**
Proj. No. EDS-441(44) Morgan County PI No.: 222570

SHEET NO.: **4 OF 4**

NO.	ELEMENT	*FUNCTION*			COST (000)	WORTH (000)	COMMENTS
		VERB	NOUN	KIND			
8	**TRAFFIC CONTROL**	Facilitate	Safe Construction	B	500,000	500,000	C/W =1.0
		Enhance	Safety	B			
9	**SIGNING & MARKING**	Channelize	Traffic	S	300,000	300,000	C/W = 1.0
		Enhance	Safety	S			
10	**GRASSING**			RS	216,000	216,000	C/W = 1.0
11	**GUARDRAIL & ANCHORING)**	Enhance	Safety		155,000	155,000	C/W = 1.0
12	**FIELD ENGINEER OFFICE**				60,000	60,000	CW =1.0
13	**CONCRETE CURB & GUTTER**				26,400	26,400	CW =1.0

Function defined as: **Action Verb**
Measurable Noun

Kind: B = Basic
S = Secondary
RS = Required Secondary
HO = Higher Order
LO = Lower Order

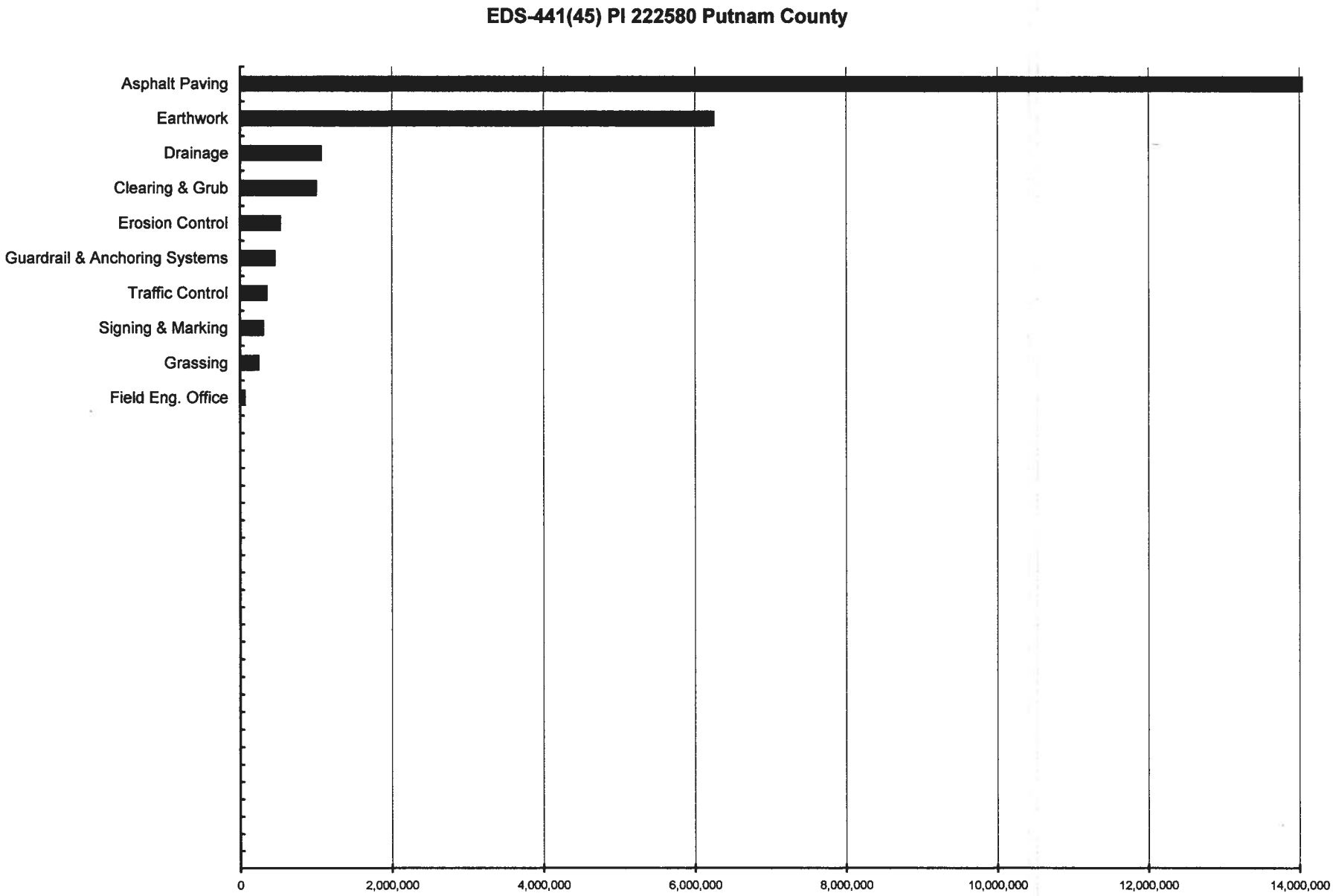
Cost/Worth Ratio =
(Total Cost + Basic Worth)

PARETO CHART - COST HISTOGRAM

PROJECT: US441/SR24 Improvements EDS-441(45) PI No. 222580
Putnam County, Georgia

PROJECT ELEMENT		COST	PERCENT	CUM. PERCENT
Asphalt Paving		15,292,693	59.87%	59.87%
Earthwork		6,250,000	24.47%	84.34%
Drainage		1,065,350	4.17%	88.51%
Clearing & Grub		1,000,000	3.92%	92.43%
Erosion Control		527,025	2.06%	94.49%
Guardrail & Anchoring Systems		456,700	1.79%	96.28%
Traffic Control		350,000	1.37%	97.65%
Signing & Marking		300,000	1.17%	98.83%
Grassing		240,000	0.94%	99.77%
Field Eng. Office		60,000	0.23%	100.00%
	Subtotal	$ 25,541,768	100.00%	
E & C Rate @ 10%	INCL	$ 2,554,177		
Subtotal =		$ 28,095,945		
Total Construction Cost =		$ 28,095,945		
Right-of-Way =				
Reimb. Utilities =				
	TOTAL	$ 28,095,945	Comp Mark-up:	10%

Pareto Chart 2

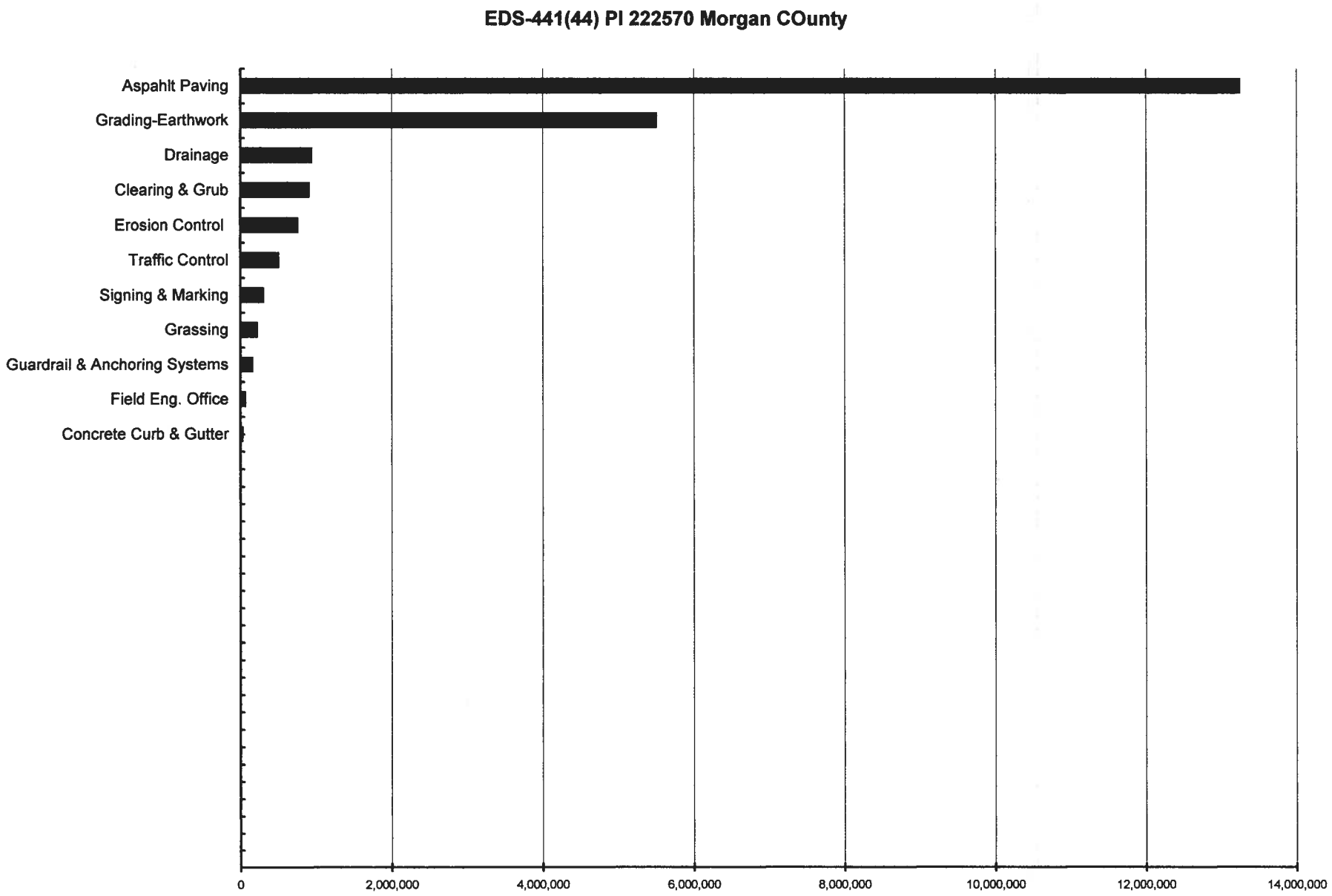


PARETO CHART - COST HISTOGRAM

PROJECT: US441/SR24 Improvements EDS-441(44) PI No. 222570

Morgan County, Georgia

PROJECT ELEMENT		COST	PERCENT	CUM. PERCENT
Aspahlt Paving		13,242,935	58.62%	58.62%
Grading-Earthwork		5,500,000	24.35%	82.96%
Drainage		937,250	4.15%	87.11%
Clearing & Grub		900,000	3.98%	91.10%
Erosion Control		754,220	3.34%	94.43%
Traffic Control		500,000	2.21%	96.65%
Signing & Marking		300,000	1.33%	97.98%
Grassing		216,000	0.96%	98.93%
Guardrail & Anchoring Systems		155,000	0.69%	99.62%
Field Eng. Office		60,000	0.27%	99.88%
Concrete Curb & Gutter		26,400	0.12%	100.00%
Subtotal		**$ 22,591,805**	**100.00%**	
E & C Rate @ 10%	**INCL**	**$ 2,259,181**		
Subtotal =		**$ 24,850,986**		
Total Construction Cost =		**$ 24,850,986**		
Right-of-Way =				
Reimb. Utilities =				
TOTAL		**$ 24,850,986**	**Comp Mark-up:**	10%


EDS-441(44) PI 222570 Morgan COunty
Aspahlt Paving
Grading-Earthwork
Drainage
Clearing & Grub
Erosion Control
Traffic Control
Signing & Marking
Grassing
Guardrail & Anchoring Systems
Field Eng. Office
Concrete Curb & Gutter
0
2,000,000
4,000,000
6,000,000
8,000,000
10,000,000
12,000,000
14,000,000

DESIGNER PRESENTATION

MEETING PARTICIPANTS

Geogia Department of Transportation			10-Sep-07		
EDS-441(44)(45) PI Nos. 222570 & 222580 Morgan/Putnam Counties					
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VE TEAM PRESENTATION
MEETING PARTICIPANTS

Geogia Department of Transportation — 13-Sep-07

EDS-441(44)(45) PI Nos. 222570 & 222580 Morgan/Putnam Counties

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CREATIVE IDEA LISTING & EVALUATION

PBSJ

PROJECT:	**Georgia Department of Transportation – EDS-441-(44)** **Morgan County PI No. 222570**	SHEET NO.:	1 of 2

NO.	IDEA DESCRIPTION	RATING
	ROADWAY (RD)	
RD-31	Realign roadway to reduce required Right-of-Way	4
RD-32	Reduce Median width to 32' to reduce Right-of-Way	4
RD-33	Adjust fore slopes to reduce earthwork and Right-of-Way	1
RD-34	Do site specific slope adjustment to reduce ROW	2
RD-35	Utilize Right-of-Way for sedimentation ponds	DS
RD-36	Utilize Right-of-Way to consolidate driveways	DS
RD-37	Use RAP from existing roadway	5
RD-38	Retain existing pavement	4
RD-39	Retain existing pavement for the shoulders	2
RD-40	Extend five lanes with shoulders to Sta. 476 +/-	DS
RD-41	Realign the horizontal from Ste. 130 to 200	See RD-31
RD-42	Re-design Seven Island Road intersection	DS
	EARTHWORK (EW)	
EW-31	Vertically bifurcate the roadway to reduce earthwork	4
EW-32	Adjust fore slopes to reduce earthwork and Right-of-Way	4
EW-33	Reduce vertical alignment to reduce earthwork	4
	DRAINAGE (DR)	
DR-31	Reroute median drains to downstream side of road	DS
DR-32	Reduce/consolidate sediment basins	DS
DR-33	Modify ROW to accommodate outfall maintenance	DS
DR-34	Re-evaluate elimination of outfalls	DS
DR-35	Re-align cross drains	DS

Rating: 1→2 = Generally not acceptable; 3 = Little Opportunity for Positive Change; 4→5 = Most likely to be Developed; DS = Design Suggestion; ABD = Already Being Done

CREATIVE IDEA LISTING & EVALUATION

PBSJ

PROJECT: **Georgia Department of Transportation – EDS 441-(45)** SHEET NO.: **2** of **2**
Putnam County PI No. 222580

NO.	IDEA DESCRIPTION	RATING
	ROADWAY (RD)	
RD-1	Reduce median width to 32' to reduce Right-of-Way	4
RD-2	Adjust fore/back slopes to reduce earthwork and Right-of-Way	1
RD-3	Do site specific slope adjustment to reduce Right-of-Way impacts	2
RD-4	Re-align roadway to reduce required Right-of-Way	4
RD-5	Utilize Right-of-Way for sedimentation basins	DS
RD-6	Utilize ROW to consolidate driveways	DS
RD-7	Use RAP from existing roadway	1
RD-8	Retain existing pavement	4
RD-9	Retain existing pavement for shoulder	4
RD-10	Relocate Harmony Rd to minimize new construction	4
RD-11	Adjust Bethel Church Rd alignment to enhance the safety of traffic	DS
RD-12	Adjust Price Road alignment to enhance the safety of traffic operations	DS
	EARTHWORK (EW)	
EW-1	Vertically bifurcate the roadway to reduce earthwork	4
EW-2	Adjust fore slopes to reduce earthwork and Right-of-Way	4
EW-3	Adjust vertical alignment to reduce borrow	4
	DRAINAGE (DR)	
DR-1	Route median drains to downstream side of road	DS
DR-2	Reduce/consolidate sediment basins 435+00	DS
DR-3	Modify ROW to accommodate outfall maintenance	DS
DR-4	Re-evaluate elimination of outfalls	DS
DR-5	Reduce cross drains	DS

Rating: 1→2 = Generally not acceptable; 3 = Little Opportunity for Positive Change; 4→5 = Most likely to be Developed; DS = Design Suggestion; ABD = Already Being Done